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An enactivist narrative of one PhD journey.

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Abstract

If students do not perceive an assessment task as suitable for assessing them, do they fully engage with the task? If not, does the task allow them to fully demonstrate their attainment? This thesis began life as a quest to investigate students' perceptions of assessment. The original aim was to use the results of this investigation to improve the assessment regime in use on a particular mathematics subject knowledge enhancement course (MEC) attended by the participants of this study.

As time passed, my circumstances changed. It was no longer possible to pursue the original aim. Also, I moved towards an enactivist stance where knowing is doing. As a result the nature of this thesis changed. Instead of being purely focussed on students' perceptions it is now a narrative of my research journey retaining the theme of students' perception at its core. This narrative lays bare the nature of undertaking PhD research.

Analysis of students' reflective logs and semi-structured interviews led to questions being raised about the nature of the link between students' motivational orientation and their sense of fairness of assessment tasks. In addition, turning the idea of investigating how to make tutor feedback to students more effective on its head, by applying feedback analysis methods to students' reflective, logs shows promise as a method to gain deeper understanding of students' engagement with learning and assessment.

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Author’s declaration

I declare that the work in this thesis was carried out in accordance with the requirements of the University's *Regulations and Code of Practice for Research Degree Programmes* and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

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Contents

Appendices 221

List of tables

List of figures

Abbreviations

ACME – Advisory Committee on Mathematics Education

AERA – American Educational Research Association

AfL – Assessment for Learning

AL1 – Algebra 1 (module of work on MEC)

AoL – assessment of Learning

AMET – Association of Mathematics Education Teachers

APA – American Psychological Association

ATM – Association of Teachers of Mathematics

BBC – British Broadcasting Corporation

BERA – British Educational Research Association

BSRLM – British Society for Research into Learning Mathematics

DCSF – Department for Children, Schools and Families

DfE – Department for Education

FV – Face Validity

GCSE – General Certificate of Secondary Education

GT1 – Geometry and Trigonometry 1 (module of work on MEC)

ITE – Initial Teacher Education

JCSEPT - Joint Committee on Standards for Educational and Psychological Testing

LMT – Leading Maths Teacher

MEC – Mathematics Enhancement Course

NCME – National Council on Measurement in Education

NCTL – National College of Teaching and Learning

NSPCC – National Society for the Prevention of Cruelty to Children

NSS – National Student Survey

OFQUAL – The Office of Qualifications and Examinations Regulation

OU – Open University

PGCE – Post Graduate Certificate of Education

QCDA – Qualifications and Curriculum Development Agency

QTS – Qualified Teacher Status

SET – Student Evaluation of Teaching

SKE – Subject Knowledge Enhancement

SoW – Scheme of Work

TDA – Training and Development Agency

A note about my use of literature

Unlike most academic papers I have read there is no single literature review chapter in this thesis. My engagement with the literature is distributed throughout as it becomes relevant. I am writing following a timeline, trying to keep events ordered as they occurred. It is perhaps more like a wobbly spiral as ideas link both back and forward in time from *now* to my previous engagement and understanding of an issue *then* and my understanding *now* in what was the future back *then*.

In life I read broadly, and probably quite eclectically, ranging from academic work through popular science, newspapers, to a wide range of fiction. In fact if something is written I will probably read it. This wide engagement with written work in all forms is always behind me in how I understand the world. And my understanding changes with each thing I read and each question I ask.

By gathering all the literature into one literature review chapter at the outset, I feel that it is putting the final picture in one place. As such, I disagree with Cohen, Manion and Morrison (2011) who seem to imply that a literature review should be done first to inform on the size and scope of the piece of research. Rather, what I want to achieve, as I write, is to reveal my emerging ideas and understanding, which are closely linked with what I read at that time. Indeed, Silverman (2011, p. 5) does not approve of what he calls a "conventional trajectory" of reviewing the literature before gathering and then analysing data, preferring instead to begin the research on the very first day (as I have done with my pilot study – chapter 4, pages 31-48). However, he does not explain how he thinks the literature should be integrated into the thesis. For me, it is the conjunction at a point of time that is important. Had I encountered ideas in a different order, I may have done something completely different.

A good example of this is in section 3.3 (pages 23-29) when I read about Face Validity (FV). Firstly, I only came across the idea of FV through a chance conversation with someone who suggested it. I read about FV as a way of explaining fairness in assessment. I then searched for literature specifically about fairness. It was only later, by re-engaging with the writing, that I realised that I could have developed FV itself as it had been neglected, perhaps giving me a way of designing fairness into assessments. Had I realised this earlier, this thesis could have been something other than what it is.

This example also gives a taste of how I have engaged with the literature in general. So how else do I select literature?

Attendance at conferences, such as the British Society for Research into Learning Mathematics (BSRLM), Association of Mathematics Education Teachers (AMET), Association of Teachers of Mathematics (ATM), Association for Educational Assessment - Europe (AEA) and the British Congress

of Mathematics Education (BCME), has enabled me to engage with a wide range of other researchers within mathematics education and within assessment. I have also presented at BSRLM. In addition, I attend mathematics education seminars organised within the School of Education where I am studying and the School of Mathematics where I teach, which keep me up to date with key people and key ideas. The most recent series of seminars in the School of Mathematics have all been focussed on assessment issues within mathematics teaching.

The structure of the PhD programme itself also offers starting points to engage with literature through reading lists and wider reading encountered in the taught units. Discussion with my supervisors almost always offers suggested reading linked to ideas I am exploring.

All the above are possible starting points, as are, indeed, my own questions. I start out by searching on the web using key words and phrases to identify a list of interesting looking sources related to the question. Often the same names appear when I follow citations or vary the search terms. If so, I believe that may be an authoritative source e.g. Ryan and Deci (2000) whose work I discovered whilst looking at internal and external motivation. However, as described in section 4.3.3 (pages 36-37) it is often a lone voice that speaks for the whole, or a single voice that has something important to say (section 6.1.8.1, pages 81-87). I, therefore, also look at the relevance of the source to my question and not just its frequency. In general, I prioritise more recent sources over older ones. However, it is sometimes important to look back through the history of the development of ideas. FV is a good example of this as the most up to date texts hardly explore the topic at all and give the impression that it is of little importance (section 3.3, pages 23-29). I tend to prioritise recognised peer-reviewed journals over other sources, but, as above, relevancy may mean that I will include non-academic or less academic sources, e.g. Mantel (2017).

Maxwell (2006) argues that whilst a literature review should set the ground for the research to be done, in a doctoral thesis its purpose is not that of informing the world about the topic in hand. Rather, he argues, it is to make clear the choices made by the researcher in undertaking their thesis. In Maxwell's (2006, p. 28) view relevance is more relevant than "comprehensiveness or thoroughness". I feel that my approach is in line with that of Maxwell.

Maxwell (2006) further argues that the doctoral researcher should be taking from the literature those aspects that are useful, which I believe I do. In doing so, this raises the question for me of what is not useful. Following links often leads me to interesting questions that start to move away from my central focus, in which case, I may not mention them at all or I may include a brief description of how they are linked whilst stating it will not be explored further at that point, as to do so would dilute my main focus. Thus, whilst following my own version of literature review, I am also

using it to limit and contain the research I am doing, restricting the size and scope of the research as espoused by Cohen et al. (2011). Where I differ from Cohen et al. is that I am doing this research as an ongoing embedded process not an up-front one-off process.

To summarise, I am not attempting to present a complete synopsis of any of the topics I engage with, but what I do present engages with the questions in hand allowing them to be explored further, helping to set the boundaries of the scope of my thesis.

Chapter 1: Introduction

1.1 About my original motivation

I have been a mathematics teacher for over twenty years. Initially I worked in a wide range of secondary schools and more recently in the university sector. Having always valued flexibility and variety, I have purposely worked in such a way that I take on short-term contracts alongside a part-time and longer-term employment. I have thus been fortunate, having taught in seven schools (including Post Graduate Certificate of Education (PGCE) placements), four universities and an international college, to experience a wide range of educational settings each with its own culture, organisation and attitudes. Contrasting how the same things are done differently and reacted to differently in different settings has been thought provoking and raised my awareness that teaching and learning, including assessment, are complex processes that interlink rather than there being a direct cause and effect.

My interest in assessment came into sharp focus one day when, as a Leading Maths Teacher (LMT), I was invited to work with the county's mathematics advisor to help roll out the Assessment for Learning Strategy (Department for Children, Schools and Families [DCSF], 2008) across our schools. We were discussing aspects of the strategy and the resources that had been made available for us to use with teachers in schools. Whilst talking about aspects of questioning and getting children to think for themselves, I remember sitting there wondering why this was an issue because it was essentially describing what I set out to do in my class every day. Eventually, I could not bear it anymore and said, "Surely this was not something extra and new that teachers needed to know, isn't it simply teaching?" One of the others said that it was likely that those of us in the room all felt like that, but that there were many teachers out there who did not work in this way. That was when I realised that I had been embedding assessment in my teaching in a way that meant, for me, teaching and assessment were indistinguishable. In my world, if I was not doing this sort of questioning and problem posing, I was not teaching. Up until that moment, I had not thought of what I was doing as assessment in the way we were discussing. All of a sudden I realised that I was, in fact, assessing on every level all the time. From that moment on, for me, teaching and assessment were inextricably entwined. I now believe that if you are not assessing in every interaction on every level all the time you are probably not teaching effectively.

That is not to say that I had not thought about assessment before, but, in that moment and reflecting on it later, I became aware of assessment as being far more than I had previously

considered it to be. Although I had been building up over time an awareness that assessment was important. As a teacher starting out on my career I did not think it was any more important than the myriad of other aspects of teaching that I was developing, but it turned out to be a significant or critical event in my development as a teacher. I will return to critical events in sections 5.4.3 (pages 57-60); 5.6.3 (pages 69-71); 7.2 (page 92); 11.2 (pages 129-139).

At the start of my teaching career, I had little insight into children's knowledge and capabilities. At the outset, I taught pretty much how I had been taught. I was thorough. If a topic was in the Schemes of Work (SoW) I taught it, with hindsight whether the children were ready for it or not. I assessed pretty much how I had been assessed, giving a score for the number of questions answered correctly and a cursory "well done", "good try", or "must try harder" type of comment. I meticulously recorded marks in my mark book.

Over time I came to realise that my "10 out of 10" system was flawed. I knew about individuals in my class in a way that could not be encapsulated in a single score. Moreover, the correlation between what I had taught and what the class could do was much weaker than I would have anticipated.

Children would often say, "We've done this before", yet, when I taught the topic appeared to know nothing. At other times, I would teach what should have been a brand new topic only to discover that everyone could do it already. I got fed up with hearing, "We've done this before" and decided to find out if they had already learnt the topic (and I note as I am writing, that I have changed from using "I taught" to "they learnt"). I will return to reflecting on the learners' perspectives in chapters 5 (pages 49-72) and 11 (pages 129-164).

As a result, I developed a pre-teaching and post-teaching test system, which helped me to identify what my class actually could and could not do, as well as to see how much progress individuals made. It enabled me to focus my teaching on what needed to be learnt. A welcome side effect was that it linked into the school's target setting processes, making sense of target setting for both me and the children for the first time.

Although I did not realise it at the time, my awareness of assessment as an intrinsic component of teaching had begun. I now consider that teaching and assessing are synonymous in many respects.

It was only when I began to listen to my learners and respond to their perceptions that I began to develop my awareness of assessment. Equally, whilst the children still disliked tests they learnt to appreciate an increased focus on their own learning and progress.

When I moved on from school teaching to work in the university sector, as the course leader for a Mathematics Enhancement Course (MEC), I took my interest in both assessment and the learners' perspectives with me. One of my main aims was that the assessment regime should be meaningful to both students and tutors, and support learning.

In one of the early cohorts a student, whom I will call Geraldine (section 2.3, pages 12-15), had a long discussion with me about an assessment that she though was unfair. It was the one I was probably proudest of, as it gave insight into the students' achievements and limitations, and, was individual to each student. It was this individualised aspect that Geraldine thought was unfair. Because it was different for everyone she said it could not be compared. Comparison was not an important factor for me, the focus on the individual was. However, this discussion led me to realise that students' perceptions of assessment could be widely different from mine. Moreover, as was the case with Geraldine, their perceptions could lead to them failing to fully engage with the task, and hence fail to demonstrate their true achievements. Lack of engagement could have the effect of rendering the task useless for gaining insight into that student's understanding (sections 3.2 & 3.3, pages 21-28). This intriguing thought has stayed with me since then and I believe forms another critical event (sections 5.4.3, pages 57-60; 5.6.3, pages 69-71; section 11.2, pages 129-139) for me.

1.2 About the story to come

When I started the voyage of discovery that this thesis represents, I set out to find out more about how my students form their perceptions of assessment, how their perceptions affect their engagement with assessment, and whether and in what ways their perceptions can be changed.

Since then my job has changed. This has necessarily altered the direction of my investigation into students' perceptions of assessment. I will come back to the original context and to this change in more detail in chapter 9 (pages 111-116).

In deciding how to progress when the direction I had been travelling became closed off, I eventually returned to the starting point, to that moment that changed my understanding of the nature of assessment and refocussed my investigation from that point. This process led me to the question of how perceptions of assessment change as one progresses from starting out as a trainee teacher to becoming more experienced. Unfortunately, this route had too many barriers to progress (see chapter 9, pages 111-116). So I returned once more to reassess how to proceed.

In the following chapters I intended to tell the story of the development of my investigations into students' perceptions of assessment.

I started out on one journey but before I could reach my intended destination I was forced by circumstances to return to my starting point and set out again on a different journey. That is not to say that I wasted my time by any means. I learnt a lot about assessment; about perceptions; about the process of research and about myself, all of which I am bringing to bear as I now travel in a new direction. If I had tried to write a *traditional* research paper, I would have had to miss out the essence of the way I lived this experience. It is not linear, nor parallel, but complex and interweaving. I have struggled with a format that always sounds to me like I set out to do something, I did it and this is what I found, which for this investigation is blatantly not the case. Hence my decision to write the story of my engagement with the research process, largely as a time-based sequence of events and developments. I hope to show how my original research design was developed and how it has been adapted to meet my new circumstances. I start at the beginning (chapter 2, pages 9-18) or at least with the MEC, which is close to the beginning, and end, probably not at the end but, at the point I am at when I have to end.

In the next chapter I will expand on the context of the MEC and how my motivation to begin this thesis arose.

Chapter 2: MEC: Embedded contexts

In chapter 1, I outlined how my experience as a teacher led to my interest in assessment and how the question of students' perceptions of assessment arose. In this chapter I describe in more depth the context I was working in when I began this thesis, i.e. the Mathematics Enhancement Course (MEC). I will start with some background and the national picture before describing how it was enacted locally. Finally I will explore more fully the conversation that triggered this work and the ideas of fairness and perceptions of fairness that arose from that conversation.

2.1 MEC: National context

In 2004, the UK government set up a pilot of the MEC at two UK universities. At the time, there was a growing shortage of well-qualified mathematics teachers in the UK. I heard apocryphally, about that time, that every mathematics graduate in the country would be needed to train as a mathematics teacher if the shortage was to be overcome. In fact there were approximately 30,000 graduates in Mathematical Sciences in 2004 (Universities UK, 2015), whilst 1462 Secondary Mathematics Newly Qualified Teachers (NQTs) entered the workforce (Smithers & Robinson, 2007). I estimate that schools employ approximately 20,000 people to teach mathematics. With approximately one-fifth of mathematics lesson being taught by a non-specialist (British Broadcasting Corporation [BBC], 2003) there was a shortage of around 4000 mathematics teachers. If the aim was to ensure mathematics was taught by specialist teachers, another 3500 mathematics specialist teachers would have been needed.

The Training and Development Agency (TDA), the government agency responsible for teacher recruitment at that time, had the idea to run the MEC, a six-month full-time intensive face-to-face course aimed at providing mathematics knowledge to a standard that would enable the participants to undertake a Secondary Mathematics Post Graduate Certificate in Education (PGCE) and other routes to Qualified Teacher Status (QTS) alongside those graduates of mathematics and related subjects that had been traditionally accepted. Whether, and in what ways, the mathematics knowledge acquired by MEC participants is equivalent to that of the mathematics graduates has been studied by others (e.g. Gibson, O'Toole, Dennison & Oliver, 2013) and is not the point here.

The TDA followed the progress of the two trial courses and their participants closely. The trial was deemed successful at increasing the pool of suitable applicants for Secondary Mathematics PGCEs

and was then rolled out nationally in 2006. I became involved with the programme at this stage when I was appointed to set up and run the brand new course in my region.

The country was split into 12 regions and universities bid, often as consortia, to run a MEC for their region. The aim was to ensure that the courses were spread around the country roughly equally to aid accessibility. The majority of the courses followed the same format. They ran for 26 weeks and had 550 hours of face-to-face contact time, although, even then, the way this was used varied from institution to institution. The whole programme was closely monitored and supported by the TDA.

On my MEC, we attracted a lot of career changers and people who had previously thought they were not eligible to become mathematics teachers even though they would like to be. In 2006, all participants were career changers. As the course became more well-known this changed to about 50/50 new graduates and career changers. In 2018, approximately 40% of trainees in the targeted subjects came through this route (National College of Teaching and Learning [NCTL], 2018).

In 2011, the Enhancement programme was broadened, with more institutions becoming eligible to run the courses and the way they are funded was also changed (Department for Education [DfE], 2010). At the same time, the courses were rebranded and are now known as Subject Knowledge Enhancement Courses or SKEs. Some of the restrictions on how the course should operate were lifted and now there are many that run remotely without the face-to-face contact. There are questions around whether the remote courses can give the same experience and knowledge of mathematics as the face-to-face courses. Although not specifically focussed on Mathematics, Ross and Bell (2007) reported that online learning environments and face-to-face environments deliver approximately the same outcomes when there is a low level of cognitive demand, but differ considerably with high-cognitive demand. This view is backed up by Lu and Lemonde (2013) who recommend that “online delivery is best kept for those courses not requiring high cognitive skill levels”. Kemp and Grieve’s (2013) work showed that undergraduates preferred face-to-face class discussion rather than discussion online, but were happy to do written work online. In their study of face-to-face Mathematics SKE courses Edwards, Hyde, O’Connor and Oldham (2015) provide evidence that a high importance is placed on face-to-face teaching, as it was on the MEC I ran. There is a lack of research evidence as to the effectiveness of online SKE courses, however one conversation on The Student Room (2016) backs up my view that the online courses are not delivering the desired outcomes. I feel strongly about the need for face-to-face teaching on SKE courses. It is disappointing that I am at the moment unable to find good evidence contrasting the outcomes of the two approaches, but despite being an important issue for me, it is not the issue I am addressing here and so I will leave it to others to answer.

2.2 My MEC: Local context

The original brief for the MEC stressed the interconnectivity of mathematical ideas and the need for teachers to appreciate the connections if they are to enable their pupils to make connections themselves. For me, designing the local MEC, this was liberating. Instead of having to teach from a scheme of work that split mathematics up into small unrelated chunks, I was able to look at it as a whole and design the course so interconnections were not only made possible, but actively encouraged. For example, I planned to have the same ideas appear in different strands at the same time e.g. binomial expansions in algebra at the same time as they arose in probability. The course was designed to cover certain concepts, but within a belief system that it did not matter what mathematical content was taught. I felt that the way in which the participants engaged with the mathematics was more important than the specific content. I, and my team, worked with a flexibility that meant we could explore with students what cropped up rather than follow a rigid structure. What was important was that the participants understood why the mathematics worked, how it was interconnected with other areas of mathematics and became confident to explore mathematics for themselves. In that way, if they encountered new concepts in the future they would have the skills to explore, understand and make links for themselves. My belief in this method of working has arisen from influences encountered throughout my teaching career through membership of the Association of Teachers of Mathematics (ATM), using sources such as Crockcroft (1982), Stacey, Burton and Mason (1982), Banwell, Saunders and Tahta (1972), Polya (1957) and many, many more.

I was also responsible for designing the assessment regime. The assessment regime was therefore set up to assess understanding and connections, as well as skills. I was determined from the outset that the assessments used would be useful to either the tutors or the students or, preferably, both.

The first time through the course there was no plan for a formal assessment regime. The TDA guidance said that the course leader had to comment on each participant's suitability to progress to their chosen Initial Teacher Education (ITE) route. Throughout the course, the participants were asked to do homework tasks which the tutors set and also tasks they selected themselves. For example, after a class on a particular topic the students might choose to use exercises from their textbooks to practise the skills appropriate to that topic, or they might choose to continue working on an investigation that had been started in class. In fact we often started the day by asking people to tell the rest of the class what they had been working on. Sometimes the tutors might set a task that everyone had to begin at home, as it would form the basis of whatever was to occur in the following session. Sometimes we set a written task to be given in, but this was more likely to be along the lines of create a game that could be played based around a specific topic. This was linked

with a regular tutorial system where student and tutor would discuss and record progress, difficulties and plan how the student would address difficulties etc.

As we got closer to the end of the course, the students started asking how they would know if they were successful. This made me realise that they needed some sort of formality about their progress to ITE. As a result, it was decided that each student would do a project on a topic of their choice (which they discussed and agreed with a tutor). Once they had been marked, and the students had been given feedback, they each had to present their project to their tutors and peers. The course leaders for the ITE courses they were destined to were also invited. As well as receiving a written report from me, they could see for themselves what each individual had achieved. I believe the students enjoyed working on their projects and felt quite relaxed about the task.

In the first year, the assessment regime was fairly informal and highly individualised. Over the following years, pressures from within the university led to a more formalised system, which meant that the assessment regime also became less individualised. In order to give meaningful feedback, we initially used an assessment grid based on the idea Profound Understanding of Fundamental Mathematics (Ma, 1999) given to us by another MEC. However, it was not always easy to use and so we later modified it based on our own experiences. An examples of our version of the grid is available in section 10.4 (page 125).

The external pressure continued and so the formality of our assessment regime was increased, despite my best efforts, year by year over a period of time. By the time I left the job, my perception was that although most students enjoyed being able to work on a project of their choice, most found the activity stressful, whilst some even found the choice of topic stressful. I believe this is because they were afraid that a bad choice would impact on their marks, reinforcing my desire to explore the students' perceptions of assessment and its effect on their engagement with assessment.

2.3 Geraldine: Individual context (of a conversation)

I referred to Geraldine in section 1.1 (page 5). I had run the course a few times through by the time Geraldine took it. Geraldine was a mature student with previous industrial experience. She was a mum and making a career change after taking time off to bring up her children. She was practical and down to earth. As indicated previously, Geraldine was upset when she received peer feedback on one particular assessment task. She asked to have an individual meeting with me to discuss it, which I will return to below.

My rationale in setting up this task was:

1) to give the students a task that they would find meaningful
2) to enable students to think about what they had been taught, and whether they needed to do more practice on any aspects
3) to self-check their own work
4) to include peer feedback.

I believe I achieved this by:

1) Each student had to write a test and associated mark scheme of no more than twenty questions, on indices, surds and logs that would be suitable to use with their peers on the course. As teachers in the future they would be writing tests and mark schemes so why not gain a little experience of that here?
2) They would have to review what had been taught prior to writing the test, and hopefully address any aspects they felt weak on before writing it.
3) The mark scheme they produced had to be correct.
4) Every aspect was peer reviewed, as I will describe next.

I split the students into three equal sections. Based on their achievements on previous assignments, I attempted to identify the third who would supply the 'hardest' tests (group A), the third who would supply the 'easiest' tests, or tests that would contain 'dubious' questions e.g. questions that could not be answered (group C), and the rest went into the middle third (group B). The students then sat a test written by a peer.

I then split the class into groups of three with an A, B and a C in each group of three. Within each group, person C sat the test written by person B; person B by person A; and person A by person C. My thinking being that those who had themselves written the easiest tests or tests with errors in were less likely to be able to answer the hardest ones, whilst those who had written the hardest ones would be most likely to be able to deal with poor questions.

Following this, each person wrote feedback on the test they had sat commenting on whether it was an appropriate test which covered the required content and would give a good indication of anything the person sitting it had done well or needed to improve on.

Each person then marked the remaining test in their group i.e. the one they had neither written nor sat. I.e. A marked the paper written by B and sat by C; B marked the one written by C and sat by A; C

marked the one written by A and sat by B. This fitted with my rationale above because it meant that C (the most likely to not understand everything) had the mark scheme written by A (the most likely to have written an easy to use, correct and fully explained, mark scheme).

At the same time as marking the test paper and writing feedback to the person about how they had done on the test itself, they also had to check that the mark scheme was correct i.e. mark the mark scheme, and give it a percentage score. Finally, they wrote feedback about the mark scheme, commenting on how easy it was to follow and how correct it was.

The tutor (me) then gathered everything together to give back to the correct person, having looked at all the work and collated an overview.

As a tutor, this was complicated to organise and fairly time consuming, although probably less so than having to assess and write feedback on every single one myself. My main concern with it was, that, if I could assess in advance how people would do on the task, why was I setting the task in the first place? But I believe my rationale for setting the task answers this in that there was learning and self-checking involving in creating the work in the first place, as well as the value of peer review.

Geraldine was upset when she got her peer feedback and requested a tutorial to talk about it, and we talked about the issues outlined below.

Geraldine did not like the task. She thought it was unfair because it was different for everyone. (I thought it was fair for precisely the same reason.)

Peer feedback to Geraldine said that she had made lots of careless mistakes when answering the test paper she sat, and there was some evidence of misuse of rules of logs. Peer feedback on her mark scheme said that she had made careless errors in the mark scheme, and that she had used the rules of logs incorrectly. The peer comments accurately reflected what I would have written as feedback myself. Geraldine accepted that these comments were correct and that she needed to double check her work to avoid errors, and to do more work on logs to ensure she understood them thoroughly. To me this was excellent because she now knew what to do next in order to improve, but Geraldine continued to insist that the task was not valid because some people had sat easier papers than others. Did this matter if whichever paper she sat would have identified for her what she needed to do next? Somehow it did to Geraldine.

Thinking about my conversation with Geraldine, in which she had not changed her mind at all about her perceived lack of validity of this task, I decided that by valid she meant fair. I would dispute that it was unfair since everyone had the same opportunity to create an excellent test and mark scheme, and although everyone sat different tests they had individual feedback on every aspect of the work

they had created and advice on how to improve. In contrast to Geraldine, by valid I think it means that it tests what it sets out to test, and perhaps Geraldine's sense of fairness would be best described as a wish for reliability, i.e. that the same result would be obtained if the task was repeated.

There are two aspects to explore further at this juncture. Firstly, there is the question of fairness itself, and secondly the appearance of fairness.

2.3.1 Fairness

Lam (1995) may shed some light on the difference in how Geraldine and I viewed fairness in assessment. According to Lam, an assessment is unfair and does not achieve its purpose if it does not allow all the students to show what they know.

Lam is making his comments in the context of Performance Assessment, which involves making judgements "about student knowledge and skills based on observation of student behavior or inspection of student product." (Lam, 1995, p. 1). This feels similar to the context I described above in use on the MEC.

Lam uses the words *equality* and *equity* as a way of thinking about fairness. By equality he means that everything is standardised in the way the assessment is set, i.e. "using identical assessment method and content and the same administration, scoring, and interpretation procedures." (Lam, 1995, p. 1) However, he goes on to say that there is still bias in this situation because different sub-groups may respond in different ways, e.g. students from ethnic minorities. An equitable assessment, by contrast, would be tailored to the individual student. He says, "by adjusting scoring and grading procedures individually based on student background and prior achievement, fairness is directly addressed" (Lam, 1995, p. 2). In my opinion, Geraldine was seeing fairness based in an equality approach, whilst I was seeing fairness by using methods that are closer to the equity approach. Indeed, my concerns about pre-assessing who should sit which test are overturned if I take an equity approach, since the pre-assessment is necessary to allow each person to show what they can do, not what they cannot.

However, whilst explaining the difference in our views, thinking about equity and equality also highlights the differences. It is probably not possible, since I do not know where Geraldine is now, but I would like to have a discussion now with Geraldine about how and in what ways her views of fairness in assessment have changed over the intervening years

working as a teacher. I am wondering if the difference in our views could be explained by the fact that at that point in time Geraldine was a learner having to submit to assessments, whilst I was an experienced teacher whose views of assessment had changed and matured over the years. This is a question I will return to briefly in section 9.2 (pages 111-116).

2.3.2 Appearance of fairness

Geraldine raised an interesting question for me about the result, because it depends on what one thinks the result is. If it means you would get roughly the same percentage on sitting any of the tests then no it is not reliable as some of the tests were easier than others. But if the result is that everyone has individualised feedback that helps them to improve and make progress in their learning then surely it is?

I was studying for a master's degree at time of this conversation, which had raised my awareness of the nature of validity and reliability. As a result, I was wondering how valid Geraldine's use of the word valid was in this context and happened to discuss this with a psychologist friend one evening. He suggested I look at face validity, which I had not heard of before.

Face validity sounded like a good starting point, and was indeed the point at which I decided to undertake this PhD. The way it had been described to me was that face validity meant that the assessment looked as if it assessed what it was supposed to i.e. on the face of it, it did what it said on the tin. My initial ideas were that I would investigate students' perceptions of assessment linked with the concept of face validity, but at the outset I did not have any real idea of what I expected to find and where I would end up. I only knew that I found these ideas extremely interesting.

Linked to the idea of the appearance of fairness, Geraldine's attitude made me wonder if students did not believe an assessment was fair, did they engage fully with it? Or to put it another way if they perceived it as unfair did they go on to demonstrate their true abilities? Or maybe something less than that? This is a question I found intriguing and I return to it in section 3.3 (pages 23-32).

2.4 Conclusion

In summary, in this chapter I have shown how my past experience as the course leader of the MEC led me to explore the idea of fairness in assessment and to question more widely how do students perceive assessment. In the next chapter I will explore in more detail issues related to assessment, including face validity.

Chapter 3: Assessment

In this chapter I summarise assessment literature that I have previously explored as part of my master's dissertation, since this is one of the initial steps on the path to where I am now. I then move on to some aspects which bring perceptions to the fore because I am now exploring students' perceptions of assessment. I also look at face validity and fairness in more detail as these are ideas that I encountered in chapters 1 and 2.

3.1 Assessment (and understanding)

My original moment of awareness regarding assessment (section 1.1, page 5) was when I was working with our local county mathematics advisor on the Assessment for Learning (AfL) aspects of the National Strategy. Thus, Assessment for Learning is an appropriate place to start to look at the literature. Many people have worked in this field, such as, Black and Wiliam (1998), Maclellan (2001), Stiggins (2002), Black, Harrison, Lee, Marshall and Wiliam (2003) and Swaffield (2011).

The key word in Assessment for Learning is *for* because this is in contrast to *of* as in Assessment of Learning (AoL). Initially, this could be thought of as AfL being equivalent to formative assessment, whilst AoL is equivalent to summative assessment. Formative assessment is taken to mean classroom assessment designed to inform the teacher and learner about learning in progress, whereas summative assessment is taken to mean an assessment such as a school-leaving examination, or an end of term test.

However, the situation is more complex than this with much debate over exact meanings. My own experience, as a school teacher, of using the same test pre- and post-teaching demonstrates this. I used the results pre-teaching formatively in order to identify whether I could assume that the class was secure with certain content, or maybe I needed to re-address some aspects with one or two learners individually; or, whether it looked like, as a class, they had been taught that topic before and needed a reminder, perhaps through starters; or whether a topic needed to be re-taught/taught from scratch. As well as using the end-of-module test summatively to report to the department, I also used it formatively by looking at progress made by individuals, and the class as a whole, in order to feed forward into later blocks of work. At the same time, I was able to focus the learners individually on where they had made good progress and where more was needed, so they were better informed about their own learning.

Thus, the difference between formative and summative assessment is not in the nature of the assessment task itself, rather, in this case, it is how the task is used, i.e., it is its purpose that is important, a view backed up by Newton (2007) and Harlen (2005). Swaffield (2011) argues on several grounds that formative assessment and AfL are not synonymous, for example, formative assessment can be done to the learner whilst AfL includes the learner in the process. Taras (2005) believes that the timing of when assessment occurs is an important factor, i.e., during teaching, or at the end of teaching, rather than the nature of the task. In other words a summative task can be used formatively, as I described in my own practice above.

Another aspect to consider is what is being assessed. As my own teaching developed, my focus on the needs of the learners, rather than my own needs, grew and I became more aware of what I was trying to assess and why. Over a period of a few years, I changed from trying to assess if children had got the correct answer to trying to assess if they understood what they were doing. A large part of studying for my master's degree in Mathematics Education was exploring what it means to understand and trying to define understanding, in order to be able to better assess understanding. I attempted to define understanding in order to answer the question, "How can I know if my students understand the same as me?

In brief, my conclusions were that understanding cannot be represented by any single or simple model (Pirie, 1988). I encountered many models of understanding, for example Bruner (1966), Skemp (1971, 1976), White and Gunstone (1992), and Mousley (2005). I drew on Skemp's (1979) idea of schema, in which isolated concepts become more connected as understanding takes place. That connections are an important part of understanding is backed up by Mousley (2004), whose literature review demonstrated that development of understanding is focussed on "connected knowing". I finally settled on the following as the best definition of understanding I could come to at that time:

> A mathematical idea or procedure or fact is understood if it is part of an internal network. More specifically, the mathematics is understood if its mental representation is part of a network of representations. The degree of understanding is determined by the number and the strength of the connections. (Hiebert & Carpenter, 1992, p. 67).

Hiebert and Carpenter (1992) said that, in order to avoid a situation where an individual task is performed by rote without understanding, we need to assess using a range of different types of assessments, but the more generally available methods of assessing mathematics are focussed on skills rather than understanding. Whilst, White and Gunstone (1992) believe that many assessment tasks are assessing a narrow range of understanding and that a much wider range of methods is

needed in order to assess understanding more fully. I agree that skills are important in mathematics but on their own do not demonstrate understanding. For example, The Advisory Committee on Mathematics Education (ACME)'s (2011) report shows clearly that stakeholders want school leavers with mathematical thinking and problem-solving skills, but it was possible to gain a high grade in the then current mathematics A-levels with little or no understanding of how to apply mathematical skills in a new situation.

More recently, there has been consultation by The Office of Qualifications and Examinations Regulation (OFQUAL) on and review of the A-level syllabus in the UK to include more problem solving (Office of Qualifications and Examinations [OFQUAL], 2013). It remains to be seen whether the proposed focus on assessing problem solving will lead to a change in the way mathematics is taught and hence learnt. The first examinations on the resulting syllabus were sat in the summer of 2018. As yet (June 2019) there is little evidence available for drawing conclusions on whether this has changed as only one cohort has sat the new style examinations (OFQUAL, 2019)

According to Wiliam (1998, p. 1), "… we start out with the aim of making the important measurable, and end up making the measurable important". This feels right to me. I used to teach what was assessed not what it was important to learn. An example might be only teaching the class to use the quadratic formula to solve quadratic equations. But working through the derivation of the formula might give an understanding how it relates to the number of roots, of the symmetrical nature of the roots, and so on, in other words of the underlying mathematical structure.

It is widely agreed (e.g., Mason, Burton & Stacey, 2010; Polya, 1957) that it is important to learn to understand what one is doing, i.e., to think mathematically. Hence, on the MEC, I aimed to assess what each learner understands and wished to develop methods of assessing understanding.

3.2 Perceptions of assessment

It is argued that student learning is shaped by assessment (e.g., Clausen-May, 2000; Orsmond, Merry & Reiling, 2000). Sambell and McDowell (1998) described the assessment process as a hidden curriculum in that students understand certain messages about what they need to do for each assessment they undergo. Moreover, students may be reading different emphases into their understanding than their tutors.

Struyven, Dochy and Janssens' (2005) findings indicate that students' perceptions of assessment tasks are strongly linked with their approach to learning. Tasks viewed as inappropriate or unfair are

more likely to lead to surface learning, whilst those viewed as authentic, perhaps relevant to their subject in the world at large, were more likely to lead to deeper learning. However, they caution that it is far harder to ensure deep learning occurs than to encourage surface learning. Therefore it is important to be aware of how students perceive tasks in order to be able to make modifications; making tasks more meaningful and fairer. Similarly, Pollard and Buckley's (2005) findings show a mismatch between students and staff perceptions of assessments. Whereas staff believe assessment tasks have been designed to assess understanding and critical analysis i.e. a relational approach, students often believe those same tasks require a rote learning or instrumental approach. Hence students use an inappropriate learning style to prepare for their assessments. Pollard and Buckley (2005) argue that rather than changing assessment tasks, it is necessary to explore how students' perceptions of assessment can be changed so that they believe they need to learn in a relational manner. Perhaps Geraldine (section 2.3, pages 12-16) would have perceived the assessment task as more meaningful to her had some of the rationale behind our thinking been made more explicit to her in advance?

Whilst the assessment task itself can impact positively or negatively on learning, it is also recognised that formative assessment can have a positive effect on students' perceptions (Black & Wiliam, 1998; Higgins, Hartley & Skelton, 2002). Baily and Garner (2010) found that good feedback, received in a timely manner, is associated with good teaching and can be used to inform future work. Although this is not always the case, in their literature reviews, Tang and Harrison (2011) and Higgins et al. (2002) found that tutors sometimes thought their feedback was detailed/useful whilst the students did not find it detailed/useful enough. Sometimes the students do not understand what has been said to them. This could be, for example, because the terms used by the tutor are not clear (Baily & Garner, 2010); or because the tutors' feedback used language that is tacitly understood within their community of practice (Higgins et al., 2002) and the students are not yet fully embedded in this community.

As MEC course leader, I strove to ensure that the tasks chosen impact positively on students' learning. As indicated above this is not always the case, a point backed up by Stuyven et al.'s (2005) findings that students' approaches to learning are strongly related to their perceptions of the assessment tasks. Hence my aim when I started working on this thesis was to better understand how students' perceptions of assessment are formed, how their perceptions change over the course of the MEC and how their perceptions affect their engagement with tasks.

3.3 Appearance of fairness: Face validity

If tasks viewed as inappropriate or unfair lead to surface rather than deeper learning, as surmised in section 3.2 above, that would fit my conjecture in section 2.3.2 (page 16) that if students view an assessment task as unfair they do not engage fully. The concept of face validity (FV) appears to offer a way of describing whether an assessment task looks to its users as if it sets out to test what it says it says it does, so I set out to familiarise myself with the concept of face validity.

Using Google Scholar to search for FV, I was surprised how few results addressed FV directly. The two items returned that appeared to be useful to me were Mosier (1947) and Nevo (1985). There are a few other papers from the 1990s and 2000s, so my first thought was why was there such a long gap from 1947 to 1985 and then on into the 1990s?

I decided to look at FV from a historical perspective initially to get a sense of how the idea developed starting with Mosier as this was the earliest paper I could find that addressed FV explicitly.

3.3.1 Mosier

Mosier (1947) seemed to have a difference of opinion to his peers about them using the term FV in a variety of different ways, but as there is no reference section in his paper it is impossible to tell at whom his paper was directed. There are a few people, e.g. Sanders (1920), Flanagan (1939), prior to Mosier (1947) who use the term FV but none define it. Mosier (1947) attempts to address the absence of definition.

Mosier (1947) thinks that the term FV is used in different ways by different people which could lead to misunderstanding. In his opinion their uses fall into three categories Validity by assumption, Validity by definition, Appearance of validity, and having said there were three he threw in a fourth one, Validity by hypothesis. These four ideas are summarised below.

According to Mosier (1947), the term FV appeared to be invented for Validity by definition.

Validity by Assumption (VA)

VA is based on common sense or pragmatic approach that the appearance of links between external criteria and the test is sufficient for it to be valid. According to Mosier this is a "pernicious fallacy" (Mosier, 1947, p. 194) which allows test constructors to overrate their own abilities leading to conflicting outcomes from seemingly valid tests. He gives an example

of two tests designed to test clerical filing skills. Both appear to do just that, but the outcomes were starkly different with no correlation between them at all, hence at least one of them must not be valid at all.

Validity by Definition (VD)

VD comes from situations where the test criteria are intimately or implicitly related to the test questions, such as adding two numbers from 1 to 10. Here it is possible to generate a set of 100 questions (2+3= and 3+2= are different questions) and then choose the test questions from this set, so the test is valid by definition. But as Mosier (1947) points out reliability would limit the validity since the layout of the questions alters the outcome, e.g. writing the question as a word problem, as a column addition or as an in-line addition. According to Mosier (1947) the test's validity is only a measure of what it can measure reliably.

The Appearance of Validity (AV)

As Mosier (1947) points out, in some situations it is important that a test appears valid, such as in Civil Service tests. He says the test must be seen as valid both by the employer and the possible employee. In cases such as this, or examinations used as a gateway to employment more generally, Mosier (1947, p. 200) says "It becomes highly important that, …, a test … not only *be* valid *…,* but *have the appearance of validity* as well.", otherwise we get situations where candidates for the test excuse their poor performance on the test being unjust in some way. From my point of view, this accurately reflects the conversation I had with Geraldine (section 2.3, pages 12-15). Mosier (1947) raises further questions which I find of interest, but do not want to follow up here whereby if a test is seen as unfair/not reflecting a true test of their abilities (sic.) high performing individuals could be put off from taking it, and, in the case of the Civil Service, for example, result in lower calibre employees than one would hope for. Thus he argues, and I agree, that whilst AV is not sufficient on its own to ensure a test is valid, it is a desirable attribute of a test.

Mosier (1947) thinks that AV and VA are often confused.

Validity by Hypothesis (VH)

According to Mosier (1947) VH has never been called FV but is considered because it bears a strong resemblance to FV. Here he talks about a test which has been shown to be valid with one population then being used for a different population. He says it can only be hypothesised that it is valid with the second population. Moreover, construction of a second test for the first population can only be hypothesised to be valid. It seems to me that all tests must therefore be valid by hypothesis. Although, I would argue, as does Mosier (1947), that VH is not the same as the three types of FV above because the prior situation gives a level of confidence that cannot be present in the first three.

Thinking about my discussion with Geraldine, and having read Mosier's argument I would take the term FV to mean The Appearance of Validity (AV). However, Mosier (1947) concludes that the term FV should not be used, since there are multiple meanings, rather the writer should describe the concept they are working to. Perhaps his advice was heeded hence the long gap.

3.3.2 Nevo

Moving on, in his review of FV literature Nevo (1985) refers back to Mosier's (1947) idea that a test should not only be valid but seen to be valid as his underlying take on the meaning of FV. Nevo (1985) separates validity into two categories where the first is ensuring the validity and the second is about also being seen as valid; the first containing criterion-related, content and construct validity, and the second is FV. Like me he appears to think that FV is best described by AV. By test Nevo (1985) means any test, for example an examination or a personality assessment. Wiliam (1993) holds the view that FV alone is not sufficient for a test to be valid but it is often a necessary one, particularly in high-stakes assessments such as National Curriculum assessments.

Briefly content validity is straightforwardly referring to the content being tested, criterion validity is about the test's relationship to other measures, and construct validity is about how the test relates to underlying theoretical concepts. These types of validity could be considered as the more technical aspects of test construction but are not my concern here. However their definition and usage is widely recognised as that given in the *Standards for Educational and Psychological Testing* (AERA, APA, NCME, & JCSEPT 2014).

Nevo (1985) found conflicting evidence on the importance of FV. On the one hand FV is often treated as if is not a real sort of validity, whilst on the other, some texts (e.g. Anatasi & Urbina, 1997; Brown 1983; Cronbach 1990) concur that tests with high FV lead to better engagement during test taking and reduce any sense of injustice afterwards amongst the participants, as well as attracting better candidates in the first place. At the same time higher FV also convinces those that make use of test results to use the test and gives better public acceptance. I agree, as do Anastasi and Urbina (1997), with Nevo (1985) that these are important issues and share Nevo's surprise at how little progress (none really according to Nevo) has been made in the area in the 40 years since Mosier's paper. Indeed when I have been reading about FV, that this is so is underlined by the fact that everyone refers back to Mosier!

Nevo's (1985) study looked at getting people to rate tests to gain a direct measure of FV. He suggests that the raters could be a) the people who sit the test, b) non-professional users of the test results, c) the general public, but not the test *experts*. He suggests that a rating from an expert would be hypothesised vailidity, i.e. VH rather than FV, because they are drawing on professional knowledge of test setting, and perhaps this is the sense in which Mosier chose to include VH in his set of validities. Nevo (1985) compared the results of different sets of raters and found a high level of agreement on how the tests were rated for FV. He thus concludes that not only is FV a thing, it is important and can be measured.

When I read this paper originally it re-inforced the view brought to my attention by Geraldine that the students' perception of an assessment are important and that FV would be a suitable concept to work with to explore perceptions further. Looking back now, I wonder why I did not design a study to get students to rate FV for each assessment, from which I could then work with students to work out how to improve FV year on year. If I were still MEC course leader I would give this idea serious consideration, for my own satisfaction and, because there is such a dearth of information about FV.

3.3.3 Crocker

Crocker (2003) links FV with fairness. According to Crocker (2003) if we ask students, parents and teachers about fairness in testing they do not talk about various types of validity, they talk about their personal experience of the test. Crocker says that we used to call this sense of fairness FV. For a variety of technical reasons, which are not relevant here, Crocker thinks

that FV is not taken seriously in the world of assessment, and in so doing the way people experience the assessment and their sense of fairness are in some way ignored. In other words the idea that how people perceive the assessment could be important to the outcome of the assessment. Maybe my conjecture that if people do not perceive the test as fair they do not fully engage and therefore do not demonstrate their true achievements fits here. With Lam's (1995) view (section 2.3.1, pages 15-16) of fairness in assessment this would mean that the task is therefore unfair as it has not allowed them to demonstrate their abilities, or lacks in FV if FV and fairness are synonymous as suggested by Crocker (2003).

Going back to a time before I started studying assessment as an academic venture, as a teacher I was always interested in (*incensed by* might be better words) the annual frenzy created by the UK press around A-level and GCSE results in August. If results go up, the examinations must be too easy, the teachers are teaching to the test and so on. No thought is given to the idea that perhaps the teachers are teaching better. If the results go down, the teachers are described as lazy. In other words everything seems to be blamed on teachers and examination boards for not doing their job properly without actually looking deeper at the nature of the examinations in use, e.g. has the syllabus changed, has the nature of the examination changed to include/exclude coursework perhaps, or a higher expectation of problem solving skills rather than step-by-step questions. Indeed both these aspects have changed for mathematics assessment in recent years. When coursework was removed from mathematics GCSE in England the Guardian (Curtis, 2009) reported that the number of boys getting top grades increased whilst that for girls did not.

It also struck me that over time these results were being used for a wider range of things than was their original intended purpose. A-levels, and O-Levels (later replaced by GCSEs) were introduced in 1951 originally to replace the school leaving certificate in place beforehand. The grades were normally distributed and were used as gateways to university and the workplace.

The results of GCSEs and A-levels now are used to rank schools in league tables, a purpose for which they were not designed. This led me to question whether an examination designed for one purpose can be used for another purpose, and indeed what other purposes are these results being used for that are beyond the original purpose of the test as designed. When I started studying for a master's degree in Mathematics Education, I thought it would be interesting to see how various stakeholders, such as government minister, councillors, parents, children, employers, viewed school leaving examinations, i.e. their perceptions of the examinations and the purposes they used them for. It

soon became apparent that this was too big a topic for a master's degree (and subsequently also too big for a PhD).

However both ideas i.e. purposes to which assessment is put, and stakeholder's perceptions of assessment lead me to Paul Newton. In 2007 Newton identified 18 different purposes of assessment. He states that even for similar purposes it cannot be assumed that an assessment designed to suit one purpose can be used to serve another, and goes on to explore whether GCSEs and A-levels are actually suitable for their stated primary purpose. He also raises the interesting question of how does one ensure that, having designed an assessment system to serve its primary purpose, the assessment system is not used inappropriately for other purposes. These are questions which I find interesting and have thus remained in the back of mind throughout and to some extent inform how I think about assessment and the links that I make.

In 2012 I attended a seminar in Oxford entitled Public Perceptions of the Purposes of assessment, where I discovered that a book on Validity in Educational & Psychological Assessment (Newton & Shaw, 2014) was due out shortly. Having contacted Oxford University, although the seminar was videoed at the time it is no longer available.

3.3.4 Newton and Shaw

Newton and Shaw (2014) explore the history of the debates surrounding validity, what is meant by validity and how it is and should be used from the mid-1800s to the 21st Century. In this book Newton and Shaw (2014) describe how validity became an important consideration within the field of testing. As its importance grew the range of ideas related to validity also grew. The field became fragmented with many conflicting views and sub-types of validity emerging which gradually became more harmonised, with the many sub-types becoming largely harmonised under the titles content, construct and criterion validity. Whilst the debate over validity is far from over there is now a set of commonly understood terms to work with.

FV, however, is only mentioned three times in the whole book and so is perhaps perceived by Newton and Shaw (2014), as not being a *real* type of validity. Although, they do very briefly touch on FV when looking at whether (large scale) tests are acceptable to the public. At this point they raise an interesting question, which is should takers of personality tests actually be aware of what the test is trying to measure? If they are they may alter their answers, although when taking tests that measure *achievement* it is important to know what

is being measured. Newton & Shaw (2014) argue that, in the case of achievement, failure to be open about what is being measured could be a construct problem and could also be linked with lack of engagement.

This neatly leads me back to idea that FV is linked with motivation and engagement. It is also apparent to me that FV has had little or no attention since Nevo (1985), which led me to give up on the idea of using the work of others on FV as a foundation for exploring perceptions relating to assessment of my own students, and look for a different way forward based on the ideas in section 3.2 (pages 21-22), starting with a range of questions such as; How do the students perceive assessment? What is important to them? Do they change their perceptions as they progress through the course? Could I amend assessment tasks each year to engage the students more?

3.4 Conclusion

Looking back now, I realise that I missed an opportunity to work on expanding understanding of FV itself by following on from the work of Nevo (1985), as I was not aware of this as a choice at that point. Had I done so, I could, perhaps, have developed a way of deciding if an assessment task had FV from the point of view of my students.

However the questions raised above gave me a way forward and in the next chapter I will present my initial ideas on how I might begin to answer the questions I have raised above.

Chapter 4: Students' perceptions of assessment: Initial ideas

In the previous chapter, several questions were raised as a result of investigating face validity (FV) and fairness, such as: How do the students perceive assessment? What is important to them? Do they change their perceptions as they progress through the course? Could I amend assessment tasks each year to engage the students more?

In this chapter, I will describe how I used work done previously for my master's dissertation, described in section 3.1 (pages 19-20), and section 4.1 below, as a basis to design a pilot study to begin this exploration of students' perceptions of assessment.

4.1 Brief summary of my master's work on assessment.

In order to work on assessing understanding, I needed to know what I meant by understanding. I began by defining understanding in terms of the number and strength of connections made by an individual between different aspects of mathematics and the world, drawing on the work of Hiebert and Carpenter (1992), Sierpinska (1994), Bruner (1966), Nickerson (1985), Wood (1982), Skemp (1971, 1976, 1979), White and Gunstone (1992), Barmby, Harries, Higgins and Suggate (2009), Mousley (2005) and Pirie (1988). Starting with Hiebert and Carpenter's (1992) definition of understanding, given in section 3.1 (page 20), I developed the connections aspect further by incorporating Mousley's (2004) ideas on types of connections summarised as:

> connections between new and old knowledge (p. 378)
> connections between different areas of mathematics (p. 380)
> connections between mathematics and everyday experience (p. 381)
> personal connections with mathematics (p. 377).

Following evaluation of my findings, I concatenated everyday experiences and personal connections into one category because I found it impossible to distinguish between them. Thus, I finished with a frame consisting of three categories of connections.

Connections made as a result of a learning experience are classified as *connections between new and old knowledge*. *Connections between different areas of maths* could be, for example, the realisation that pascal's triangle is used in probability and in binomial expansions. Although, depending on how the topics are introduced, this could be a link between old and new knowledge. *Connections between mathematics, everyday experience and personal connections with mathematics* relates to making connection between mathematics as taught and the real-world, for example, when

reviewing trigonometry, one student talked about encountering trig points whilst out walking. Trig points had not been mentioned in teaching. This example sheds light on the difficulty of distinguishing between the terms *everyday* and *personal*, since trig point were not only a common everyday experience for this student but also a concept others did not know about and hence personal. It was this overlap between the everyday and the personal that meant distinguishing between them as two categories was difficult.

I knew from course evaluations that students felt that they had made connections but I did not know if their connections were the same as mine, as each other, or perhaps completely individual. Hence, I decided to look at how students on the MEC developed connections in understanding.

I used qualitative methods because, although use of qualitative methods is often seen as more valid but less reliable than quantitative methods (Brown & Dowling 1998), my focus on how people understand meant it would be difficult to collect quantitative data when individuals each have a different construct of reality (Denscombe 2003).

Barmby et al. (2009) describe how, in order to assess someone's understanding, we have to infer connections made through observation of what they do, perhaps using mind maps or open-ended tasks where reasoning must be justified. Hence, in order to observe connections, I asked the students to put the word "trigonometry" on a blank piece of paper, then use the paper however they wished to record what they remembered about trigonometry before the MEC trigonometry unit. I repeated this after teaching the topic and compared the two sheets each had produced. Next I identified and categorised connections that had changed from before and after being taught using the three categories of connection I had identified as my frame.

I believed that because I was the tutor and was also setting up how I wanted this task done, there was likely to be a high level of researcher bias in my analysis (Cohen, Manion & Morrison, 2007), hence I followed up by individual discussion with targeted individuals using semi-structured interviews (Miller & Brewer, 2003) giving time and space to answer as they wished.

With regard to new/old connections, at the outset I imagined that the students would retain the old connections they had already made and simply add new connections to their existing map or schema. I was surprised to find that this did not seem to be the case. Rather, it appeared that they deconstructed and reconstructed their schema considerably in order to incorporate their new connections (Stansfield, 2009).

I subsequently discovered that my findings fit with current thinking in that each time we recall a memory we re-remember it and reconstruct it – changing its shape in so doing, e.g., Nader and

Hardt (2009), Damasio (2012), Levitin (2014). Levitin (2014) describes how this works physically within the brain. He says memories are stored when the brain fires a unique set of neurons. In order to retrieve the memory we need to fire the same neurons in the same way as when storing the memory. According to Levitin (2014), the brain can become confused by similar memories with similar neuron patterns, so what is actually retrieved could be a reduced or a distorted version of the original event. The events we are most likely to remember accurately are those that are in some way exceptional because when events are similar the brain ties them together. After retrieving the memory, the brain stores it again afresh, thus creating, in effect, a new memory. Levitin (2014) thinks that tying memories together is essentially what we do when learning, this is what I am describing as connection.

4.2 Initial ideas for this thesis

My aim at the start of this thesis was two pronged.

First prong: I planned to develop a cohesive MEC assessment regime using assessment tools designed to test understanding rather than application of memorised rules. In my experience, tasks testing application of rules, e.g. traditional examinations, are easy to administer and mark, whilst those looking at understanding, e.g. discussions with individuals, are far more time consuming and harder to justify to other interested parties. So, I set out to try and find an optimal path balancing assessing understanding against the time needed for each task, whilst achieving my aims in a manageable manner.

My intention was to perform a literature review on assessment of mathematical understanding to further develop the constructivist view of understanding that I started to construct in my master's dissertation and to examine theoretical perspectives on assessment of understanding (chapter 3, pages 19-30). Also I was beginning to take an enactivist stance, in that assessment of understanding must be inferred through observation of actions. But at that point in time, for me, enactivist was a word not a meaning. I did not follow up to gain more depth of meaning until later on. I return to enactivism in chapter 8 (pages 97-110), where I explore what it means to be enactivist.

In addition, I hoped to discover a range of assessment techniques, which have been used elsewhere in a variety of settings, with the intention of trialling several assessment methods with my students.

Moreover, as described in the preceding chapters, it had become apparent to me that students' reactions to different types of assessment tasks vary depending on their view of the validity of the

task used to test their understanding and knowledge. They appeared to be more likely to fully engage with tasks viewed as having FV. Hence, if an assessment is to be fully effective not only does it need high levels of validity and reliability, but the students, as well as the tutors and other interested parties, need to view it as suitable for the purpose.

Second prong: I wished to explore how assessment of mathematics is perceived by different stakeholder groups, in particular my students, but also the tutors and managers within the university. I have not, in fact, fully addressed this aspect because it soon became apparent that it would be a very large task. In order to work with a manageable-sized task I decided to focus just on my students for this study, with a long-term view of possibly returning to look at perceptions of other stakeholder groups.

Regarding perceptions of assessment, I was aware that I could hold at least three different views concurrently depending on whether I am thinking as a teacher, a learner or a parent. So, one individual could fall into different groups. I do not know if this is relevant when being assessed or not, or whether the learner perspective dominates when being assessed. This was a new area of interest for me. It feels like an important point to consider because my students are all post-graduates, many of them have had other careers, some of them are parents and so they may, like me, also hold conflicting views on assessment.

Returning to my first prong, I needed to consider how best to trial different assessment techniques with the students. I had to report their progress in understanding and doing mathematics to their Post Graduate Certificate of Education (PGCE) providers and did not wish to add to students' workload by having them undertake extra assessment tasks. However, I believed it was possible that the nature of alternative methods would not add significantly to their workload. At the outset, I felt that decisions about how to proceed with this aspect could not be taken until more information on what I wished to trial was available. Finally, if successful in creating an assessment regime using tasks viewed as valid by relevant parties, I thought it would also be interesting, and relevant, to see whether the assessment regime itself could be used as a vehicle for changing the learners', and possibly some tutors', perceptions of assessment.

This first prong has been left as an idea that I would like to explore, because once I began to investigate students' perceptions of assessment it became clear that focussing on this one aspect would be a big enough task in its own right. Hence, although as a course tutor I worked every year on improving the assessment tasks, I chose not to progress the idea as a research question, leaving it to possibly form part of another study in the future.

4.3 Pilot study: First cohort

My ideas for my final research design were emerging and changing throughout this process. However, I am moving forward through time, so here I shall report my thinking back then as accurately as possible in this section, i.e. this is not my thinking now. Below I lay out my research design as it was then.

4.3.1 Research questions

Based on the reasoning laid out above, I isolated two questions to begin my investigation.

1) What do students perceive as being a valid assessment of mathematics?
2) How did these perceptions arise and how do they change?

4.3.2 Ontological and epistemological considerations

At the start of my PhD journey, it seemed like everybody else on the course was able to put themselves into ontological and epistemological boxes and stick labels on the side to say which point of view their boxes contained. I was struggling to label my ontology and epistemology because nothing sounded quite right.

Although it was becoming clear to me that it was important that I too could find and label my boxes, because as Gray (2009) says

> Despite the natural tendency for the researcher (and especially the novice researcher!) to select a data gathering method and get on with the job, the choice of methods will be influenced by the **research methodology** chosen. This methodology, in turn, will be influenced by the theoretical perspective adopted by the researcher, and, in turn, by the researcher's epistemological stance. (p. 17).

However, the idea that we each create our own understanding of the world was important to me then, and now, and underpins everything that I do. The closest label I had come across at that point in time was constructivism so that is the stance I took. Moreover, I had clearly stated in my master's dissertation that epistemologically I held a constructivist view. It is logical, therefore, that when I began work on this thesis I considered myself to be a constructivist. Davis (2004) describes constructivism as focussing on making sense of the world and revising understanding of the world based on an individual's experiences of that world. Since each individual has unique experiences they each build an individual view of the world.

I address my subsequent realisations about my ontology and epistemology in more detail in in chapter 8 (pages 97-110) when I had more insight into why this was a problem for me.

4.3.3 Methodology

I knew I needed to develop my methodology in much more depth than I had done previously, embedding it securely in clearly laid out ontological and epistemological positions. I felt that trying some ideas out then reviewing my trial was a good way forward, allowing me time to read, reflect and develop these positions.

Crotty (1998) says that in constructivist theory there is no one objective *truth* since each individual has constructed their own truth, as a result there is no single methodology nor are we constrained to any given methods. Within a constructivist world view we are encouraged to use a range of methods. Thus, I felt justified in moving forward with an ill-defined methodology for the time being.

I had previously used a naturalistic approach (in my master's dissertation) and intended to do so again because as Gray says "the world is interpreted through the classification schemas of the mind" (2009, p. 11). These schemas cannot be accessed directly. Equally, I cannot know what each individual has constructed and therefore need to be as open to all possibilities as I can with all the complexity that might bring. The naturalistic approach has many advantages in the situation I found myself, where I was not sure what I would find and therefore did not know what direction I would take next. According to Gray, "in the naturalist paradigm there are multiple realities that can only be studied holistically" (2009, p. 24), i.e. the real world is so complex that individuals can only understand phenomena from within their own environment. Gray (2009) says "research designs cannot be pre-specified and need to emerge as the research progresses" (2009, p. 25), which was exactly what I was trying to do, and so justifies my stance.

Additionally, I thought it important to be able to identify individual voices. Hensher, a journalist with the Independent newspaper pointed out that we can and do understand history and the world around us through individual stories rather than statistical analysis. During an uprising in Egypt in 2012, he wrote "we don't even need a name, just the sense of the individual" (2012, p. 23). I feel this is an important point. After all, this thesis was started as a result of an individual's, Geraldine's, insistence that her voice was heard. I return to the idea of voice in chapter 5 (pages 49-74).

Qualitative methods are appropriate because I am looking at the perception of individuals (Denscombe, 2003), although I must establish that the methods used ensure a high level of comparability whilst keeping an open mind (Flick, 1998, p. 188).

If the students are constructing their view of the world it stands to reason that I am also. As the tutor and the researcher it seems likely that my own experiences in life generally, but more specifically as a teacher, will influence not only how I create my research project, but also how I interpret responses from my students. This view is confirmed by Gray in that "inquiry itself cannot be detached but is value-bounded by the perspectives of the researcher" (2009, p. 25), and by Flick (1998) who points out that a researcher cannot be neutral.

Jennifer Mason (1996) described three roles in the research process: that of a participant, an observer or a participant-observer. When I undertook this pilot study, I felt that the category participant-observer best described my role because, whilst I was not a student, I was not simply a participant. But to be purely an observer implies somehow being objective by standing outside and looking in. As the tutor on the course, I was embedded in the course day-to-day in a similar but different way to the students I was observing. I cannot therefore be totally objective, nor would I be expected to be able to within the naturalistic paradigm. Of the three choices, this left me with participant-observer. At that point in time, I decided this was a good enough description to move on with.

I will note here that, at that point in time, I was not a participant as in researching myself, rather I was a participant in the day-to-day environment of the course and the research process. I acknowledge that it might be useful to make my own perception of assessment explicit so as to be clear in what ways I might be interpreting my findings, and I did begin to write about my own engagement with assessment, but this was not completed and is not included for reasons which are explained in section 9.2 (pages 112-114).

4.3.4 Methods

Previously, in my master's dissertation, in order to gain insight into connections I had trawled through students' logs, assignment feedback and tutorial records looking for anecdotes related to connections. I felt I could do the same again but this time trying to identify statements that indicated how students viewed or perceived assessment with the aim of tracking changes in perception. At the outset, this felt rather undefined and

unwieldly, although I do, in fact, end up doing this later on when I chose to look at individual narratives (chapter 5, pages 49-72). I initially decided that it would be more clear-cut to look at how students perceived assessment at the start of the course and again at the end. I therefore envisaged setting up a questionnaire requiring open responses to draw out some common themes.

Ideally, I would have interviewed all the participants to follow up on their questionnaire responses, but this would have been impractical. The interviews I did were approximately 30 minutes long. I asked the students if they were willing to stay for 30 minutes at the end of the day to be interviewed. I would have needed 19 days to complete them all, or inconvenienced the students by asking them to stay even longer if I were to schedule them one after another, not to mention the time needed to transcribe and analyse so many! I therefore chose students whose questionnaire responses were interesting to me, for example, if their response had changed between the start and end of the course.

4.3.4.1 Interview design

Following the advice of Gray (2009) I decided on a form of interviewing that would sit on the border of semi-structured and non-directed interviews. Structured interviews, where questions are predesigned, would run the risk of missing important individual details. Semi-structured interviews, which follow an open frame of relevant themes, and non-directed, or unstructured, interviews, which are more conversational in nature, allow for issues raised by the interviewee to be followed up. My plan was to have an outline of areas of interest to talk about in advance in the form of an interview guide (Flick, 1998), and to allow the discussion to follow ideas raised by the interviewee.

The MEC course was due to start imminently as I was working on this design. I therefore did not have time to arrange interviews on perceptions at the start of the course, and took the pragmatic decision to use a *snapshot* approach (Gray, 2009), using instead a pre-course questionnaire to gather data from everyone. My written questionnaire took the place of an interview guide.

It then occurred to me that whilst it would not be as in depth as interviewing everyone, if I could analyse responses prior to the first group tutorial, which would occur about one week after completing the questionnaire, I could perhaps gain

further insight by inserting issues raised by the questionnaires into the tutorial. The group tutorial took a circle-time format (TheSchoolRun, 2019) where each person got the opportunity to respond to issues presented in a semi-structured manner. However, as I was thinking about this for my research, I had to consider if it was ethical (section 4.3.5, page 40).

4.3.4.2 Questionnaire design

I gave consideration to the wording of the questions following the advice of Denscombe (2003) who points out that this is difficult to get right. As a result, I attempted to produce a questionnaire that is concise, and asks only what is needed in a suitable manner for the target audience.

In order to avoid bias, I needed to ensure that my design would capture the participants' own views without unnecessary influence from me, as well as being clear about what I wanted their opinions on. Hence, I gave particular consideration to the word assessment. Because Geraldine's view of how the outcome of an assessment task was used and mine were different, I wondered in what ways students' views and teachers' views were different in general, and also what the students think the teacher is doing – which may well be different to what the teacher thinks the teacher is doing. My questions were therefore designed to focus on how the students knew how well they were doing in mathematics, avoiding the use of the word assessment altogether, and how the students thought the teachers knew how well the students were doing.

I rejected the idea of closed questions because this would force the participants to select from choices I considered important and restrict the range of views (Denscombe, 2003) and used open questions allowing the participants to respond how they chose.

At that point in time, I was not entirely clear what I needed to find out. I hoped that this pilot would help me clarify my focus, so I fully expected to review my questionnaire, both in terms of what and how I asked questions once I had completed this pilot. (See appendix 1 for the initial questionnaire, pages 202).

4.3.5 Ethics

My understanding of ethics has changed significantly since starting this thesis. I return to ethics in more detail to discuss how and why I have changed (chapter 7, pages 89-96). At the start, I had an undeveloped awareness of the need for an ethical stance and saw it in some part as a hoop to jump through to satisfy other people, and what follows here is my ethical considerations at the beginning of my research journey.

My main considerations in the pilot were how open I should be with the participants about the purpose of my research and my use of data, and about maintaining the participants' anonymity. In order to ensure anonymity, I took the simple expedient, recommended by Cohen et al. (2011), of coding each participant with a letter when writing.

Also, I was aware that if I used the same methods as in my master's dissertation, I would be using documentation generated by tutors and students as part of the normal running of the course such as tutorial logs, reflective logs and assignment feedback. I was using these anyway as the course leader to work on improving the assessment tasks. The difference being that if I was researching the improvement process does that change anything? As John Mason (2002) points out this is a grey area tied in with the idea of covert or overt research. Cohen et al. (2011) point out that being completely open can lead to participants changing their behaviour and, as a result, narrowing the range of data gathered.

This dilemma is partially solved by following the advice of Cohen et al. (2011). They say it is necessary to negotiate informed consent as the project progresses. Since I did not know what I would find nor what direction I would subsequently take, I decide to ask the students for written consent and explained to them verbally that if they knew what I was interested in it may change the way they engaged. I would tell them at the end of the course if they wished. Once I had decided on the next stage, I would review the nature of consent again. (see appendix 3 for consent form, page 207).

At that stage, I was collecting normal course data plus extra from the questionnaire and circle-time tutorials, all of which would be used to inform course improvement as usual. In addition, I needed to consider whatever use I would eventually make of this data in writing this thesis.

4.3.6 Data collection

All 19 students completed the questionnaire as part of their induction day activities. I needed to find a frame quickly within which to analyse the responses as the first group tutorial would take place the following week.

Time was of the essence as I began the pilot study. The MEC was about to begin but I had not fully designed my pilot study. However, if I did not start straightaway I would have to wait a year before I could collect data. The questionnaire, which had been designed quickly, was filled out on the first day. I had to decide immediately how to analyse it in order to insert follow-up questions into the circle-time group tutorial the following week. I therefore took a pragmatic approach. My first pass through would be to look for common themes that arose within the cohort. Rapley (2011) describes four forms of analysis that would be suitable for my purposes. He points out that despite some differences, there is a high level of similarity between them. Hence I followed his advice to develop "a qualitative analytic attitude" (Rapley, 2011, p. 274) and draw out and label themes, which can be refined later.

The questionnaire was analysed and questions inserted into the group tutorials throughout the course and the questionnaire was repeated at the end of the course. I asked students to re-consent to taking part in my research, asking for permission to use their weekly logs and assessment feedback in addition to the questionnaires, and also whether they were prepared to be interviewed before moving onto the PGCE year. Of the original 19, 16 completed the course and 10 gave various permissions to use their data. (See appendix 4 for end of course consent form, page 208).

4.3.7 Data analysis

Appendix 5 (page 209) contains coding of the responses collected for question 1 from the induction week, as an illustration of how I identified themes.

The pre-course questionnaire was partially analysed. I only looked at questions 1, 2, 3 as I did not have time to fully analyse it in the first week. As stated above, questions were inserted in the first group tutorial and I continued to insert questions into subsequent tutorials; all of which were recorded with the students' permission. Due to constraints on my time, I was not able to analyse the circle-time recordings whilst the course was in progress. I have kept the recordings to analyse at a later date. However, as these recordings are not analysed in this thesis, I have not included any further information on them. At the end of

the course I analysed two of my questionnaire questions thoroughly (questions 1 and 3) and compared with pre-course results. I also interviewed some students.

The findings of the pilot study were reported at BSRLM (Stansfield, 2012b). In summary, it appeared that the MEC students had changed from believing that marks and correct answers were the most important way of knowing how well they had done, to a reliance on feedback from tutors. Feedback was not present as a theme at the outset, so it looked as if being immersed in an environment where we gave high-quality feedback following each assessment task had enabled a change in the students' perceptions. It also raised questions to be followed up such as:

> -for an individual to gauge how well they are doing in mathematics, what does it mean to rely on correct answers and marks?
>
> -is there a difference between reliance on correct answers and reliance on marks?
>
> -who decides if an answer is right?
>
> -what is meant by reliance on teachers?
>
> -how does reliance on teachers contrast with self-help?

4.3.8 Reflection

4.3.8.1 Reflections at the end of the pilot study

The following text is taken verbatim from an assignment written about the pilot study.

> The course runs once a year so mistakes or omissions cannot be put right until the following year. Piloting this process has highlighted the need for thorough advance planning to ensure time is used effectively. In particular sufficient data analysis time must be scheduled since delivery of the questionnaire and group tutorial are constrained by the course timetable. How questions will be inserted into overall 'interview guide' for the group tutorial needs to be planned more tightly. It has also shown the importance of getting the wording right on the questionnaire and I will be including the extra phrase identified above in every question in the next version of the questionnaire.
>
> I have begun to recognise that my role as a researcher is different to my role as the tutor. I have a strong sense as a researcher of wishing to work in as natural a way as possible by using, i.e. not changing, the existing structures. However this process is making me aware that there is a conflict e.g. the need to have the data now in order to progress the research whereas as the tutor I can wait for it to occur. I therefore need to develop researcher 'radar' to sit alongside my teacher 'radar' that can recognise and capture important

> information and also consider how much these can be the same and when they must differ. It has also made me aware that I do not wish to label myself as using a particular approach until I know it is the right one. In the same way, I need to take care not to label students perceptions too quickly.
>
> The overlap between these two 'personas' leads to possible ethical conflict. Firstly, how I use data has to be considered at each stage. Am I using it as a tutor or as a researcher, or both and what implications each has. Secondly, my relationship with students will change as the course progresses and I must be careful not to use this so that as a researcher I hide behind the tutor's skirts. (Stansfield, 2012a)

4.3.8.2 Reflection now

I collected a large quantity of data. Some of which I have only looked at on a cursory level and some not at all. I am now wondering whether it is ethical to collect data that is never used. However, I did not know what I would use and fully intended to use it all when I collected it.

It is also clear to me now that the pilot study was useful to me as I can see the beginnings of my realisation that ethics is more than ticking a box on a form to say I have considered ethics (chapter 7, pages 89-96).

I was also beginning to realise the need to be clear to myself about my role at any stage. I was trying to separate my role as a researcher and as a tutor. I am no longer sure that this is possible. Whatever I do in one role will inevitably colour the way I think and behave in the other role (section 6.1.7, pages 79-80).

4.4 Pilot study: Second cohort

Having run the pilot study with one cohort using my rough and ready methods, I found that reliance on teachers and correct answers decreased whilst reliance on feedback increased between the beginning and end of the course. Although I was left with unanswered questions, I wanted to see if the same pattern would occur with another cohort.

Accordingly, I re-ran the pilot study with another cohort and will summarise and reflect on the work, which was reported at BSRLM (Stansfield, 2015) below.

I used the same questionnaire as with cohort 1, but this time I planned only to analyse questions 1 and 3 for two reasons. Firstly, so that I had the same data for comparison between the cohorts, as the first time through, and secondly, because I now knew from my experience that I would not have

time to do more. However, I did not shorten the questionnaire, again for two reasons. Firstly, I wanted to repeat the pilot study as closely as possible in every respect and therefore minimised change. Secondly, I still believed that I would come back to the rest of the data gathered at some point in the future.

This second run of the pilot did appear to follow the same pattern (Stansfield, 2015) in terms of the shift from correct answers to feedback. Thus it appeared that a sensible way forward would be to follow up on the questions that had been raised, either by discussing them in individual interviews or by trying to fine tune the questionnaire. However, responses on the questionnaires were often short, failing to give much, if any, insight into the meaning the students attributed.

I considered whether changing the questionnaire might lead to fuller responses. However, it seemed to me unlikely that however I worded the questions I would be able to elicit detailed and nuanced answers. I would, therefore, have to choose carefully who to interview, based on initial responses, to explore answers and try to tease out the details.

The shift from relying on correct answers and marks to feedback (section 4.3, pages 35-43) seemed to indicate a shift from reliance on external factors, such as teachers and marks to more self-reliance, to internal factors, in how students knew how well they were doing. As a possible way forward, I considered whether it would make sense to gather my list of themes together under two broad headings, i.e. internal factors and external factors, since I had collated quite a long list of themes despite there being only a small number of students (17 on cohort 1 and 13 on cohort 2). I could then, in some way, measure a shift between reliance on external factors to reliance on internal factors. I did not follow up this idea then. However, the idea returned to me when analysing reflective logs from the final cohort in section 11.6 (page 163). I return the idea of internal and external factors at that point.

I also became aware that I was trying to draw out and collate themes that were common across students, yet when I looked at the data the thing that often caught my eye was where someone raised a unique issue. For example, in cohort 1, one person said lack of fear was their measure of how they knew they were making progress in mathematics. I could only imagine that this student had experienced something of huge significance to them personally, which could be explored in an interview. However, all the thematic analysis methods I had looked at to that point had focussed on finding common themes, hence I decided that I needed to look again at thematic analysis in order to refine my approach (section 6.1.8.1, pages 81-87).

In addition, I became aware that the cohort size could have a significant impact on whether I could continue to work in the way I had started out i.e. analysing a set of cohort data as a cohort looking for themes. The size of this second cohort was smaller than that of the first cohort and was likely to be smaller the following year. A small cohort would make the sort of cohort analysis I had done so far meaningless. Thus, it is becoming more important that I also have a way of making sense of an individual's data on its own.

In other words, whilst I was trying to get a sense of what was important to the cohort through use of thematic analysis, whenever I looked at the work I had done so far I was becoming increasingly aware of the need to hear the individual at the same time. The question is how best to do this.

4.5 Considering how to look at individuals

In my pilot (described above), I used short descriptions of individual participants drawing on individual interviews at the end of the course and the available course documentation.

My instinct was to call my *cameos* case studies. However, Gerring (2004) defines case study as "an intensive study of a single unit for the purpose of understanding a larger class of (similar) units" (p. 342). This view is backed up by Starman (2013) who draws on several sources who describe case study as the study of an individual case. This has made me wonder if my descriptions are indeed case studies, rather they are a form of illumination of the set of cohort data

Gerring (2004) draws a distinction between what he calls single- and cross-unit studies. Cross-unit studies involve more than one unit. Starman (2013) considers case study to consist of one or multiple cases, with the proviso that each case is investigated individually before being used for comparison purposes, as in Gerring's cross-unit studies. This seems to be the situation in my pilot study as I write about more than one unit i.e., participant. However, the cohort itself could be considered a single unit or case (Starman, 2013) to be analysed as I have done and perhaps then compared with other cohorts. I am thus happy that I could proceed on two levels at once if I wish. Each individual participant can be considered as a case study in their own right. These individual cases can be compared within the cohort in line with the idea of cross-unit study as in the pilot study. Equally the cohort can be treated as a case in its own right and can be compared against other cohorts.

Starman (2013), again drawing on several sources, makes the point that by selecting to study a single case we are selecting what will be studied and explored but not necessarily the methods by which it

will be explored. Yin (2009) puts forward five rationales for single-case selection; critical case to test a theory; extreme or unique case; representative or typical case; revelatory case; longitudinal case.

Flyvbjerg (2006, p. 7) points out that Eysenck (1976, p. 9), originally did not regard the case study as anything other than a method of producing anecdotes, later realising that "sometimes we simply have to keep our eyes open and look carefully at individual cases--not in the hope of proving anything, but rather in the hope of learning something!" Flyvbjerg (2006) believes that universal theories are not possible in social sciences, but learning is always possible. He says that we only have individual cases and context-dependent knowledge to draw on, a view I concur with.

In my pilot study, I used two *cameos* to illustrate and contrast students' perception. The first was chosen as a unique case, since this was the only one who talked about fear, and the second as a representative case since their description was of how their perceptions changed from correct answers and marks as important to feedback, enjoyment and learning through engaging with assessment tasks. The first could also be a revelatory case, in that it is highlighting fear as an important factor, which I could have chosen to follow up specifically if I wished. Stake (2006) points out that whilst it is important to look at common features, it is often the case that it is the most atypical case that will enhance our understanding the most.

Since I will choose the cases to be studied, I could be accused of researcher bias. I believe the choice of cases is mine, it can be no-one else's since I *am* the researcher. Yin (2009) points out it is how the researcher progresses in using each case that is important, and they should be open to alternative interpretations. Stenhouse (in Burgess & Rudduck, 1993) suggests that the case study is part of its local context, hence hypotheses can be raised but no generalisations can be drawn. Both these ideas are already important to me in how I am progressing my research, however it does not harm to state them here.

I do not feel that consideration of case study per se is adding any insight into how to fit together individuals and cohorts in a meaningful way. I think that, as I suggested above, what I have done so far is merely using the individuals to illuminate the cohort, rather than case study since I have not taken any individual and interrogated them as an individual before making comparisons. However, it has brought into sharper focus that I could do so if I wish and that I can proceed on two levels at once, that of the cohort and that of the individual. The need to see individuals more individually is also highlighted by the idea that an atypical case can bring more understanding than a typical one. The only way I can see what is typical is to look across a whole cohort. Once I have done that I can see what is atypical by what is left over.

4.6 Concluding reflection

In summary, I had methods that were giving useful insights, and raising questions that I might wish to follow up. Moreover, as a result of actually collecting data and attempting to analyse it, I was becoming aware that an ethical stance is important. Also, I feel that as a result of the act of *doing* research, I was learning about *how* to do the research. It seems apparent to me now that using the methods I had decided on led me to begin to consider the methodology i.e. *how* I would interact with the data, and that this ultimately led me to understand that I have epistemological and ontological viewpoints, which I return to in chapter 8 (pages 97-110).

The next step I made in considering *how* I would interact with the data I was gathering occurred by happenstance, when I encountered narrative analysis. I describe how and why narrative analysis became my method for engaging with the data on an individual level in the next chapter, chapter 5.

Chapter 5: Integrating narrative into my research design

In chapter 4, I identified the need to focus on an individual's perceptions, as opposed to that of the whole cohort. In this chapter, I will describe how and why I came to integrate the use of narrative analysis into my outline plan in order to do so. Drawing on the literature, I will explain what is meant by narrative and report on my first attempt at narrative analysis.

5.1 Focussing on the individual

Having worked with thematic analysis for the whole cohort, I could see common ideas. I realised that looking at the individuals whose views fitted well with the ideas that were prevalent within the cohort gives one perspective. But what about those who do not fit? I had previously found that interviewing individuals gave me greater insight into whatever theme I was looking at. I, therefore, needed a way to think about individuals.

Where the students have given me permission, I have access to their reflective logs; tutorial records; feedback sheets, which contained tutors' feedback and the students' responses on their assessed work; the pre- and post-course questionnaires that I analysed in chapter 4 (pages 31-47), interviews. Taken together these documents contain a variety of information about each student which I can draw on. Analysing them together would give more information about how each student thinks.

In chapter 4 (pages 31-47) I considered how I could look at the cohort as a whole. Doing so also shed light on the power of looking at each participant individually.

I had not heard of narrative inquiry as a research tool before embarking on this thesis but the word narrative is in common use. I felt comfortable with the idea of narrative on an everyday level. I often listen to Radio 4 and frequently hear people reviewing books, or people's lives, or world events, talking about the narrative of their lives. In my own experience of talking to students about a difficulty they are experiencing, I will often ask them to tell me about a specific example in order to illustrate the problem as this helps me to understand their difficulty and therefore help them.

Wang and Geale (2015) describe, from a nursing perspective, how narrative inquiry is a useful methodology to aid in their understanding of patients' views and experiences by drawing out the meaning from patients' stories. They believe narrative inquiry allows voices to be heard that may otherwise remain silent, communicating their findings to a wider audience through the use of these stories. They highlight how narrative can be used by researchers to listen to and understand

participants through hearing their stories. It is only with hindsight that I can see clearly that this is what I was searching for.

5.2 Narrative and narrative inquiry

5.2.1 Narrative

I have described my everyday understanding of narrative and also given an example of how narrative inquiry can be useful, albeit in a different field. Before continuing I shall consider in a more detail what is meant by narrative and narrative inquiry.

Very simply, narrative is a spoken or written account. It is a story. According to Riessman (1993), our participants are storytelling; storytelling is also what researchers do when they analyse and report on their data. According to Bell (2002), human beings make sense of the world through the stories we tell of our experiences and those aspects of our experience we select to include in our stories. Thus, the story is not an objective rendition of those experiences (Ochs & Capps, 1996). Rather, it reflects the individual's perception of those experiences. Indeed, Chase (2005) describes narrative as "retrospective meaning making – the shaping or ordering of past experience" (p. 656).

The story can take many forms. Chase (2005) describes how narratives exist on several levels. A person could tell a story of one incident, one phase of their life, or their whole life, all of which could be described as personal narratives (Holstein & Gubrium, 2012; Riessman, 1993). Narratives can also exist in many forms: journals, letters, interviews, or other written and spoken forms (Ochs & Capps, 1996).

5.2.2 Narrative inquiry/analysis

Putting it simply, narrative inquiry, or narrative analysis, analyses the story itself. Chase (2005) describes narrative inquiry as an interdisciplinary approach, which draws on a wide range of methods and approaches, but the central point is an interest in the story told by the person who lived it.

Riessman (2008) describes several ways of analysing narrative. Her chapter headings are thematic analysis; structural analysis; dialogic/performance analysis; and visual analysis.

According to Riessman (2008) thematic analysis is the most common method used in narrative analysis. She says that unlike in other types of qualitative studies, where thematic analysis is used across cases, narrative researchers stay with the story of the individual case. Linking to case study, narrative research depends on single case studies rather than multiple case studies (section 4.5, pages 45-46). Thematic analysis focuses on the content of *what* is said, rather than how it is said and the circumstances in which the story arises. There is no one way of performing a narrative thematic analysis.

The fourth method, visual analysis, relates to pictures or videos, which I do not have, or possibly to body language, which I would only have access to had I videoed interactions at the time. So, this category does not come into my considerations.

Structural analysis is about *how* narratives are constructed/organised (Riessman, 2008). There are many aspects that could be considered via structural analysis such as grammar and genre. Structural analysis can be quite technical such as analysing the structure of sentences with a sense of the purpose of the story teller in their use of that structure. In terms of spoken words, the participant's use of their (physical) voice could be relevant, do they, for instance, speak slowly or fast; softly or loud; do they stress individual words; and/or use pauses. By looking at *how* the text is organised it is possible to add more meaning to *what* was said.

The third category, dialogic/performance analysis, is not so much about *what* and *how*, but more about *why*, *when*, *who* is being addressed (Riessman, 2008). In other words the context is important.

It seems to me that all three aspects are needed at once. Consider a simple sentence, e.g. "The dog is outside". If I look purely at content, it states a fact. But there is a huge difference between this being said in a conversational voice, when I am simply communicating the whereabouts of the dog, to the same sentence said in a panicky voice, which may well be indicating that the dog is outside when it should not be. Moreover, knowledge of the context is needed to know why this is a problem. For example, if there are workmen going in and out of the side gate, the dog could escape, or worse bite the workmen. Another member of the household will understand all of this from the simple statement. A visitor may understand that it is a problem, but not why as they are lacking the context.

I used the word "voice" with "conversational" or "panicky". The difference between the two can be seen to communicate far more than simple content. Chase (2005) notes how the

word *voice* brings with it an understanding that the communication comprises of what the narrator said as well as how they said it and where what they said fits i.e. their context, thus pulling all three of Riessman's (2008) analysis methods together. I will, therefore, use the concept of narrative voice as my main focus when engaging with narrative.

Of the documents available to me, the one with the most text in it is the reflective log. It is therefore, in my opinion, most likely to show something concrete in itself i.e. without cross checking with any other documents. I therefore decided to trial narrative analysis, focusing on voice using one student's log to see if this is a useful way forward.

5.2.3 Ethics and narrative analysis

In my pilot studies, (sections 4.3 & 4.4, pages 35-45), I used short anonymised extracts from participants to illustrate points.

As I began piloting the use of narrative for one of my MEC students, described below, I had not yet changed my approach to ethics and therefore anonymised the participant (section 4.3.5, page 40). Now, with the focus totally on this one person, to simply label them, *L,* felt at the time as if their humanity was somehow being ignored by being referred to only by an initial. I therefore used a name and called the participant for my trial *Lila*.

Sikes (2010, p. 12) says that when "writing about other people's lives, our own lives, our beliefs and values, positionality, inevitably are implicated." In other words, just as the participant has told their story subjectively, shaped their past experiences and perceptions, the researcher when writing about, or re-telling, the participant's narrative will also bring to bear their own beliefs and values. Ochs and Capps (1996) imply that "reconstrual" by the researcher is inevitable. In section 4.3.3 (pages 36-37), I positioned myself as a participant-observer for the very reason that I cannot be totally objective, a view backed up by Clandinin and Connolly (1994), who point out that there is a relationship between the participant and the researcher. But the issue at stake is not simply objectivity. Chase (2005) highlights that narrative researchers are also narrators. Moreover, they are narrators who tend to write in the first person, which could be seen as privileging their own voice over that of the participant. Speedy (2008, p. 39) is clear on this point saying, "I have the power to frame and juxtapose other people's stories". I was thus aware at the time I undertook the piloting of narrative analysis that I needed to balance the relationship between the participant and myself as a tutor and as a researcher, perhaps more so than I had previously been.

5.3 Researcher's narrative voice

If the researcher, as indicated above, is also a narrator, there could be at least two voices present, that of the researcher as a narrator and, that of the participant as a narrator. Although, how, or indeed whether, the participant's voice is heard depends on how the researcher presents the participant.

Chase (2005, pp. 664-666) draws on the work of many from the narrative world to describe three strategies which researchers use in interpreting narratives they are working with. Her list is intended to be flexible, rather than definitive. She describes how researchers use what she calls "the researcher's authoritative voice"; "the researcher's supportive voice"; and "the researcher's interactive voice". In the writing below I am using the word researcher to refer to the researcher and narrator to apply to participant in-line with Chase's usage.

There are, therefore, three levels of connection and separation of the researcher's and the narrator's voices.

The researcher's authoritative voice assumes an authoritative engagement with the narrator's words. The researcher may have a different interest in the narrator's story than the narrator, and keeps their own voice separate from that of the narrator. They tend to pose questions arising from the story as they interpret it from their perspective. Researchers using this voice can be accused of privileging their voice over the narrator's, as noted above. However as Chase (2005) points out, it also enables the researcher to elucidate on issues that may otherwise be taken for granted.

The researcher's supportive voice is at the other end of the spectrum. Here the researcher takes a low-key or muted approach as they highlight the narrator's voice. The idea is that they are bringing the narrator's story to full view. Here, the researcher can be accused of romanticising (Chase, 2005) the narrator's voice. A more realistic approach might be to aim somewhere between the two extremes of authoritative and supportive so as to gain a balance.

With the researcher's interactive voice, the researcher analyses their own narrative as well as that of the narrator with the aim of understanding themselves and how they interpret the narrator's story, at the same time as understanding the narrator's. An ancillary aim could also be to be clear to the reader about the influences that colour the researcher's interpretation. Initially I thought that the researcher's interactive voice sits between the two extremes, in that it refers to both the researcher's and the narrator's voice. However, on reflection, I think it is off to the side rather than between the two. Both the researcher's authoritative voice and the researcher's supportive voice are focussed on the narrator's voice, whilst the researcher's interactive voice is focussed on both the

researcher and the narrator. The researcher could be more authoritative or more supportive in how they present the narrator, whilst at the same time reflecting on their interpretation and influences.

At the time I originally engaged with narrative, I classed myself as using the researcher's authoritative voice, but with awareness that my view influences my interpretations. In the intervening time, I believe I have moved more towards the researcher's interactive voice and would place myself somewhere on a scale between the two. In the section below, I will describe my original interaction with the narrative which I called Lila's Log. I return to the issue of my voice in section 5.6.2 (page 69).

5.4 Lila's Log

I originally wrote about Lila's Log for my assignment on narrative. I want to report on what I did at the time, yet I am aware that I may well bring different interpretations if I rewrite it now. Not only is reconstrual (Ochs & Capps, 1996) of Lila's words possible, but also, as I look back on what I wrote previously, reconstrual of my own writing. To overcome this, I have decided that I will include a significant part of my original writing about Lila's Log, which was submitted as an assignment on narrative during the course, but I will also allow myself to comment as I write now on that writing then so that it is clear in what ways I have reconstrued the original writing. Note that my original writing in this section is identified as numbered extracts, which have been indented and are single spaced, whilst the extract of Lila's Log related to her *explosion* (see below) is included in appendix 6 (page 211). Some extracts used below have been slightly edited from the original for cosmetic reasons, such as to remove double spaces or to use a consistent referencing style.

5.4.1 Lila's voice

Extract 1:

> In line with Clandinin and Rosiek's description i.e. "narratives are the form of representation that describes human experience as it unfolds trough time" (2007, p. 40), Lila's stories and relationship interweave as events unfold, with different issues taking precedence at various times, allowing Lila to voice her unique perspective. (Stansfield, 2013c)

Reflection now: Lila has written sequentially, which is partially the structure of the log where a log entry had to be given to the tutor at regular intervals. She has also shown the timeline clearly as she describes a series of linked events.

For me, time has been one of the biggest issues to consider as I write up this thesis. How do I remain consistent with then as I write now? Certain issues take precedence at the point of telling, but other issues take precedence at different points in time.

Extract 2:

> Riessman describes two modes of interpretation.
>
> > (1) The act of storytelling in dialogue *constitutes* the autobiographical self, that is how the speaker wants to be known in the interaction; vs (2) the autobiographical narrative *reflects* a pre-existing self; there is constancy across speaking situations because the self exists independently of social interactions. (2008, p. 29)
>
> I have interpreted Lila's words under the first of these, i.e. I see Lila as constructing an image of herself as she would like to be seen. (Stansfield, 2013c)

Reflection now:

This is a report on Lila's issues then as interpreted by me then. The reflection I am inserting now could be used to comment on Lila's issues then as interpreted by me now. But, now, I am wondering what Lila would think now. Would she still like to be seen in the same way?

This discussion also links to my writing this thesis now. The beginning of this work was several years ago by a pre-existing me. Would I interpret Lila's writing in the same way now as then? I think I would.

Extract 3:

> In week 1 of the course, Lila positions herself in relation to her fellow students e.g. "I really enjoyed meeting all my fellow MEC students today"; to mathematics e.g. "When I was doing maths at school, my interest was in my results. I didn't give any consideration to the methods or actual learning process itself' and "Now I'm a mature adult, I realise maths is more creative than that". Lila *is* a mature student and it may also be that her use of the word 'mature' in this context is also positioning her in relation to the other students many of whom are younger. She also makes sure we know she is a mother, "I've thought of how both my children and I can benefit from the week's activities" and she views herself as being open to new ideas, "I'm really looking forward to hearing all the different approaches people will use to solve mathematical problems". Moreover, she is also positioning herself from the outset in relation to her audience. Her log was submitted to her personal tutor fortnightly. She adopts an informal but professional voice as she writes i.e. an awareness that her tutor is reading it runs through. For example,

> I've noticed that my experience of the tasks and my confidence depend on who I'm working with. I definitely feel more at ease with some than others, but I guess that's pretty normal. I also think working with different people and thus different personalities is important in giving insight into interaction (week 1).

And

> Whoa…….. Long division of polynomials….. I found it rather slippery to grasp at first, but felt my brain had a really good workout today! It also made me feel much better in that the student I was sitting next to, and who I would say is one of the joint top students in our class, found it slippery too so it was ME who explained the long division to THEM (week 4).

Here her use of informal language such as Whoa and capitalised words communicates a sense of joy at her achievement. Her professionalism is apparent in that she does not name people she refers to, which she possibly might if writing only for herself. Yet, at the same time as being aware of her audience, she *is* writing for herself. Throughout her log she writes in the steady, even way exemplified in the above. She demonstrates a high level of self-awareness and her writing remains calm, measured and professional even when expressing more negative relationships, e.g.

> I've only talked in a positive manner about fellow students thus far, but I am starting to feel somewhat negative about a couple of students who seem rather demanding. There are definitely one or two students I don't like sitting with. I enjoy helping, but there are a couple who seem so wrapped up in their own world that they don't seem to have any concept of how their own behaviour, i.e. their demands, are affecting other students (week 9).

Additionally, this extract shows that she is not simply concerned for herself. She shows concerns on behalf of others, and, in my opinion is expressing a highly developed sense of fair play. (Stansfield, 2013c)

Reflection now: I considered Lila positioning herself in relation to other students; to mathematics; and to her tutor. As I read this now, it takes me back and I can visualise the situation. I feel I was being fair in my interpretation. I can see the faces of the two students that Lila refers to.

5.4.2 Lila's change of voice

Extract 4:

> According to Manfred "voice is also understood as a characteristic vocal or tonal quality projected through a text" (2005, p. N3.1). One entry in Lila's log stands out from the others because of a tonal change in her use of voice. In this entry, Lila addresses her tutors directly. The entry starts, 'I'm going to vent, sorry to tutors" (week 23). There is a sense of urgency, of crisis. This is the only place she breaks

from the implicit to explicit understanding that the tutor is the audience by using her voice to demand that the tutor witness the story. With my research interest being perceptions of assessment, this entry jumped out at me because as Bruner says,

> to be worth telling, a tale must be about how an implicit canonical script has been breached, violated, or deviated from in a manner to do violence to what Hayden White calls "legitimacy" of the canonical script. This usually involves what Labov calls a "precipitating event" (1991, p. 11).

This is about cheating i.e. a breach of social expectation or a canonical script which says we should not cheat. (Stansfield, 2013c)

Reflection now: This is where the idea of a narrative event first intrudes on my thinking (extracts 7 and 8 below (page 59) for an explanation of the term narrative event). Is there always a change of voice associated with a significant event? I suspect not, but it is the change, the demand, that signalled to me to go back and pick up clues in the earlier log entries.

5.4.3 Lila's story of cheating

Extract 5:

According to Clandinin and Rosiek "narratives are the form of representation that describes human experience as it unfolds through time" (2007, p. 40) and "experiences do not simply appear to be connected through time; they are continuous" (ibid). In line with this, Lila's story began several weeks before her "crisis" occurred.

Lila's first MEC assessment task was a test in week 4. She enjoyed doing it and was comfortable with not being able to complete one of the questions. She appears to be using the log as an opportunity to unpick her thinking regarding the assessment. Over the next few entries she describes getting her results back and starting work on some other assessment tasks, going on to describe its impact on her OU modules. For example,

> There are quite a few parts to the last question to GT1, and it looks as though they will take a while so I will give it a break to continue with my OU maths. I was studying two maths modules with the OU before I started the MEC. I've not touched them for six weeks because my time has been so taken up with the MEC. After all the effort I put into those two modules prior to the MEC, I've made the difficult decision to drop one. Regarding the other, I'm adopting a pragmatic approach and will do what I can to pass. I already had to submit an incomplete assignment, the first time I've ever done so since starting with the OU six years ago, because I haven't had time to study any more for it. I've already completed one maths module and if I succeed with this one, I can still achieve a Certificate of Maths. I'm therefore reluctant to throw away the effort I've put in thus far. It's not ideal because I

> hate not trying my best, however, the MEC takes precedence so I know it's the right thing to do (week 8).

Lila's high expectations of herself are evident as she struggles with trying to complete the work for two courses concurrently. This is an example of how her stories are interleaving. Here her work on the MEC is impacting on her OU course and vice versa. At the same time, there is a strong indication that for Lila right and wrong are important. (Stansfield, 2013c)

Reflection now: Clue 1 was back in weeks 4-8, but it did not signal anything too major until the vent occurred. At the end of week 8, it looks like an issue has been resolved by deciding to concentrate more on the MEC.

Extract 6:

Over the next few weeks, Lila continues to balance her workload. But she is slightly destabilised when she receives news that one of her OU modules is to be zero weighted due to cheating.

> Throbbing headache still there but it's on the dull side so could be worse. Not a good start to the day. I opened my bag to get my study stuff out, including my GT2 assignment. To my horror, the folder I bring in every day and which had it in wasn't there. I spoke to my tutor and fortunately they were very understanding and said I could bring it in the next time. Got our C1 score back today. I've managed to pass (just) thank goodness. The tutor has been really good and let us have it as a first submission. That's made me feel much better. Arrived home to some unwelcome news. The OU assignment I submitted a couple of weeks ago has been zero weighted for everyone due to students having been caught cheating. Apparently, there are public maths forums where questions can be posted and solutions posted back. What an absolute waste of the time and effort I put into it. I have another two assignments due and it transpires those are also publicly online. I HATE cheating, what absolute idiots. I don't want to spend even more hours over those two in case they get zero weighted too. I'm just going to write up what I've done thus far, send them off and forget about them so I can concentrate and catch up on MEC stuff (week 21).

Whilst still maintaining her professional demeanour Lila manages to demonstrate her sense of right and wrong, of justice, through the use of capitals for the word HATE. In my opinion, she is allowing herself to show through a little more. But this event has the effect on Lila's engagement with her assessment tasks, causing her to lower her usually high standards and also to alter the balance between the OU and MEC work towards the MEC. (Stansfield, 2013c)

Reflection now: Clue 2 is that the resolution is perhaps not finally reached above, as the same decision is reached again here.

Extract 7:

> It would appear to be "an event selected because of its unique, illustrative and confirmatory nature" (Webster & Mertova 2007, p. 73). That it is an "event" in narrative terms is confirmed by Talib,
>
> > *Events* are the constituents of a *story*, and they are thus crucial to it. Without *events*, there will be no *story*. *Event* has been defined by Bal as a transition from one state to another, and by Rimmon-Kenan (1983, p. 15), as a "change from one state to another". An *event* is essentially a process, an alteration, which deals with the occurrence of change. As such it need not always be observably or distinctly dynamic. All it needs is a succession of two *states* and an indication that *change* has taken place, even if the change is virtually imperceptible. The idea of *change* is thus of crucial importance in the definition of event. (2011, p. 1).
>
> (Stansfield, 2013c)

Reflection now: I am reminded that in this definition, an event is linked with a change of state, even a tiny change. A change of voice is not necessary, but is perhaps a signal or clue that one should bear in mind.

Extract 8:

> And Lila's engagement with the assessment tasks has been changed by this event. She no longer wants to put the effort in. Despite her obvious feelings about cheating, she takes a pragmatic approach to the way forward and decides to concentrate on MEC work over OU.
>
> Webster and Mertova would go further and call this a critical event in the sense that "A critical event as told in a story reveals a change of understanding or worldview of the storyteller" (2007, p. 73), a definition I would agree with as this event has caused Lila to change her view of the assessment process and engage with it differently.
>
> Webster and Mertova further define events that occur following a critical event as "like events" or "other events" as follows:
>
> | | |
> |---|---|
> | Like event | Same sequence level as the critical event, further illustrates and confirms and repeats experience of the critical event. |
> | Other event | Further event that takes place at the same time as the critical and like events (2007, p. 79) |
>
> And two days later Lila reports the following event,
>
> > Got an email late last night saying that the OU assignment due at the end of this month is also zero weighted due to cheating. AAAAARRRRRGGGGGGHHHHHHHHHH!!!!!!!!!!!!!!!! I know I'll have benefitted from actually doing them, but, I had to squeeze both assignments into what little time I could spare when I could have got on with my MEC

> project. I'm now completely behind with my project so I will be spending the weekend working on that (week 21).

> Which, in the light of the above definition can be termed a like event since it is a repeat of the initial critical event. For Lila, this event reconfirms her decision to shift her focus more towards the MEC work, but with a sense of regret that she had not done so earlier. Despite her evident anguish, she maintains the professional voice she has chosen for the log even though she is actually becoming less and less calm herself as evidenced by her awareness of being behind.
>
> Although still professional in what and how she writes, my sense here is that this is slightly less formal than at the start as her relationship with her tutor has developed over the weeks since the start of the course, indicated by her use of the sound ARGH. In a previous entry, she used GGGRRRRRR to show her frustration. She is perhaps showing a little more of the feelings of the 'real' Lila within the manner of communication she has chosen. (Stansfield, 2013c)

Reflection now: In summary, having identified the critical moment, I looked back to find the lead-in, the immediate back story. It feels important, now, to be able to identify narrative events and critical events. The critical nature of an event can only be identified after the event. They are unplanned and are "intensely personal with strong emotional involvement" (Webster & Mertova, 2007, p. 83). Lila's emotional involvement is clear above and I want to stress that a narrative event becomes a critical event through the impact it has on, in this case, Lila.

5.4.4 The explosion

Extract 9:

> Lila's sense of frustration, fuelled by cheating by some unknown individuals, comes to head. It could even be said to explode when two weeks later she describes a series of incidents of cheating by one particular student on the MEC. (The full transcript of this entry is included in appendix 6, page 211). This incident stands out in many ways.
>
> The entry begins, "I'm going to vent, sorry to my tutors." In contrast to previous entries (and future ones), she explicitly acknowledges the presence of the tutor as her audience. Moreover, she is demanding their attention. She addresses her tutors directly signalling that there is something important to say and, using the log as the conduit, by going on to say,
>
> > Something happened last night, not to do with the MEC, but that has made me decide I've had enough re cheating because I don't feel it is at all fair on those of us who are honest and get through as best we can through sheer determination and hard work. There's one student (B) who I feel is taking the mickey, and who makes many of us feel extremely resentful. I feel as

> though I'm being really horrid but, I have had enough of their attitude and want to air my thoughts (week 23).

> My initial impressions are that she makes her context clear, i.e. right and wrong; fairness is important; and hard work should pay off. She tells her story of a cheating student clearly, logically and fairly. She is concerned not only with the effect this has on herself, but also on other people. She is, above all, scrupulously professional in her manner. She gives the cheating student a code. She lets the tutors know how she feels but always in a professional manner. (Stansfield, 2013c)

Reflection now: I am happy that I have reported Lila's log accurately. I have used the Researcher's Authoritative Voice in that I am forming my interpretations without consulting Lila. However, I believe that the way I have done this is allowing Lilia's voice to show in a supportive manner.

Lila is also giving her view of where her peers stand. She would have had access to their thoughts and feelings herself, and even if I have some echo of this in the logs of others who agreed to participate, it is likely to be different from the access Lila had.

5.4.5 My reflections/summary from then

Extract 10:

> As explained above, Lila's story relies on the tacit knowledge understood between her and the tutor regarding appropriate behaviour in the context of an academic course and Lila voices criticism of unacceptable behaviour from a moral high ground. In the telling she has re-positioned herself, distancing herself and the rest of the cohort from the miscreant. By invoking the tutor directly she has positioned herself closer to the tutor i.e. the teller and the audience. (Stansfield, 2013c)

Reflection now: I would like to know how the rest of the cohort felt. I may have some other logs from this cohort.

Extract 11:

> The story develops leading the reader through what happened in sequence as she describes an event from 'yesterday', another from 'today' and finally 'lunchtime' (the following day).
>
> In order to describe her interviews with women about their sisters, Tannen identifies three types narrative as follows:
>
> > Small-n narrative, big-N Narrative and Master Narratives. Small-n- narratives are accounts of specific events or interactions that speakers said had

> occurred with their sisters. Big-N Narratives are the themes speakers developed in telling me about their sisters, and in support of which they told the small-n narratives. Master Narratives are culture-wide ideologies shaping the big-N Narratives. (2008, p. 206)

In a similar manner, Lila describes a series of small stories or anecdotes, i.e. "accounts of specific events or interactions", which Tannen (2008, p. 206) might call small-n narrative, e.g.

> The tutor had photocopied a couple of the students' assignments as good examples of layout and detail that was expected to qualify as worked examples. I noticed B copying down some of the answers from the photocopies. To express then that they deserved more than "sufficient" because they got full marks was absolutely laughable in my view as it wasn't their own work. (week23)

These anecdotes are linked through the theme of student B's failure to behave in the socially accepted ways regarding hard work and learning, thus the small-n narratives are adding up to form the big-N Narrative or theme of student B as a person who cheats. (Stansfield, 2013c)

Reflection now:

I found the idea of a narrative critical event intriguing. In Lila's case, another student cheating changed her view of the reasons for engaging with an assessment task; it heightened her view of a need for fairness. In the above writing, I focussed on Lila's view of a cheating student, but as I looked back I realised that Lila is talking about fairness albeit coming from a different source than that of Geraldine.

Lila has a small-n narrative of individual stories leading to a big-N narrative of another student as one who cheats. She positions herself on the side of justice, which to my mind is also about fairness. This links across groups of people and not just individuals. Is this the Master narrative? Perhaps, and I am thinking back to Geraldine now, her narrative is about fairness! If this is the Master narrative, it gives a different way of thinking about a cohort than the more scientific analysis I used in chapter 4 (pages 31-47).

Extract 12:

Throughout her telling of the story Lila evaluates the effect of student B on herself and her peers, e.g.

> This annoyed the others because they were trying to understand how to complete the task. I've included this because I know the other students involved are unlikely to include this in their reflective log because they're not that type. They clearly feel strongly about it though because they've told me about it, and no doubt others too. (week23)

> Lila's evaluation is embedded in each of the small-n anecdotes she tells. For example, "I find the excuses that so say 'explain' their poor results absolutely unbelievable.", or "I find this attitude absolutely shocking, not only that but, there is an absolute wealth of information at our fingertips via the Internet so there really is no excuse." Again, the issue of right and wrong of social justice is strong here. Lila feels the need to speak on behalf of the rest of the cohort as she believes they will not do so themselves.
>
> Finally, in terms of positioning, having positioned herself on the side of justice, Lila does not want to be seen as the sort of person who has a negative view of the world, who tells tales so she tells a contrasting story of a student who, like Lila herself, would prefer to fail honourably than pass by cheating, thereby constructing a view of herself as someone who can see both sides of a situation. (Stansfield, 2013c)

Reflection now: Not sure why I think she thinks she can see both sides of a situation.

Extract 13:

> perhaps the result is that a tutor has been made more aware of an issue that the cohort feel strongly about, or simply that having got this off her chest Lila can now move on. However as Andrews, Squires and Tamboukou. say, "Narrative research offers no automatic starting or finishing points" (2008, p. 1). Removing the word research, we could say that narrative itself offers no automatic starting or finishing points, yet Lila appears happy that she has "finished". She rounds off by contrasting another student whom she calls student A who did work hard, with student B who didn't. This is perhaps her way of "finishing", i.e. she has chosen a mechanism which allows her to let go of the bad feeling and return to some sort of equilibrium. (Stansfield, 2013c)

Reflection now: I feel I did a good job of presenting Lilia's stories from Lila's perspective.

I have my own stories I could tell about student B, about some of the same issues as those raised by Lila, and student B's effect on me, which were significant both personally and professionally.

From where I am standing now, it would be a worthwhile exercise to write my reflections and to compare to Lila's Log in order to delve into the differences between how a tutor and a student perceive and respond to the same events. Although, I decided this would have to be a task for the future. I did, however, return briefly to this idea in chapter 9 (sections 9.2 & 9.3, pages 112-116).

Extract 14:

Lila ends by apologising to the tutors for letting off steam in this manner,

> I really apologise to my tutors for ranting like this, my tolerance has plummeted to zero. Anyhow, it's now the half-term break and I have a very heavy MEC workload in front of me. Wishing my tutors a restful half-term. ☺ (week23)

as a way of signalling that the story has come to an end and returning us into her usual mode of log writing, signalling that she has finishing "venting" and her voice returns to its usual tone.

By structuring her "vent" in this recognisable manner, Lila has ensured that her audience will understand her story.

Throughout the "vent", Lila retains her professional voice; she has boundaries she does not cross, e.g. naming. Her use of language remains within professional bounds. Not only does Lila signal her explicit awareness and invitation to her tutor through her introductory words and indicate to her tutor that she has finished "venting", but her voice is more urgent throughout this entry. She has positioned herself by standing up for justice, for what is right on behalf of herself and the rest of the cohort.

It is noticeable that there is a difference in the words that she uses when telling what and those used when evaluating. The evaluation contains more emotive language e.g. the use of "absolutely" in order to stress what she feels is important. She is allowing us to know that she is "shocked" and that how this student B has behaved is unbelievable. There is an edge of judgement to her words, which she is usually careful to avoid, yet this is still within her professional and ethical boundaries. She remains respectful of herself, her tutors, her peers, but also of student B.

Within this "vent", Lila tells a series of anecdotes of a series of events, which could be considered as small-n narratives. These anecdotes build to demonstrate the theme of, or Big-N Narrative, of cheating by student B. I consider her "venting" voice is being used as her response to perceived injustice. This, in my opinion, is her Master Narrative i.e. hard work should be valued and cheating should be decried. "A breach presupposes a norm. This founding condition of narrative has led students of the subject, from Hayden White and Victor Turner to Paul Ricoeur to propose that narrative is centrally concerned with cultural legitimacy." (Bruner, 1991, p. 15) (Stansfield, 2013c)

Extract 15:

Working through this extract of Lila's log and considering her use of voice has raised my awareness that voice is more than simply telling a story, it operates on many levels. I think this idea is part of what Riessman describes as polyphonic voice.

> Brown attends to the polyphonic nature of voice, or "the non-linear, nontransparent interplay and orchestration of feelings and thoughts" – what others might refer to as power and positionality (2008, p. 117).

> The stories told are comprised of different aspects. To some extent separating out the stories told from the embedded evaluations has enabled me to try an imagine what the narrator is feeling and hence try to interpret their meaning closer to their intention than on first reading. It has also raised my awareness that I am interpreting and reconstructing Lila's narrative through my lens and that it is possible to construct it differently. In fact, I am aware that some researchers, e.g. Riessman and Green, have done multiple readings and hence interpretations of a piece of narrative.
>
> According to Bruner, "we organise our experience and our memory of human happenings mainly in the form of narrative – stories, excuses, myths, reasons for doing and not doing and so on" (1991, p. 4) and "narrative comprehension is amongst the earliest powers of mind to appear in the young child and amongst the most widely used forms of organising human experience" (ibid, p. 9). My attempt at analysing this extract has shown me that this is no easy matter. (Stansfield, 2013c)

Reflection now: As I read about narrative inquiry and at the same time was analysing Lila's log, I was becoming more aware that narrative analysis would allow me a way of trying to understand a situation from the student's perspective and also to communicate to others what the individual was taking from the situation. This is important because no two individuals will have placed the same emphasis on the same aspects.

My analysis, in chapter 4 (pages 31-47), was showing me that there are common themes but I believe that each individual has arrived at their beliefs and understanding by different routes, so simply identifying the themes is not enough. Using narrative I can also identify the route taken.

5.5 Reflections now on …

5.5.1 … narrative - a poem

Whilst looking back in my notes, I found a poem I wrote when I was bored in a narrative session. I had forgotten about it, but really like it now. I think it might fit as a summary of why I want to use narrative.

My scarf

I have a multi-coloured scarf.
I fold it.
I wrap it round my neck.
I am not happy with what I see in the mirror.
I refold it.
I am happy.
I can go out now.

I present to the world the scarf as I would like to see it.
No one knows about the orange section hidden underneath.
When the wind blows some people see the orange then it is gone.

My students write or speak in response to my questions.
They show me what they want me to see and hide what they wish to conceal.
I would like to see the orange side of their words.

5.5.2 ... narrative as truth?

As I engaged with the literature and ideas of narrative inquiry, I struggled to work out to what extent narrative is used to report facts, or whether fictionalised accounts are research.

I felt that if I report the stories of the participants; contrasting them with the stories of others; drawing conclusions or raising more questions as a result; using their stories as told to me without the intention of changing them; then I am, in some way telling the truth in reporting my research. But what if I change their story, miss parts out or tell it in a different order for example?

A tutor, on the narrative inquiry course I studied, wrote stories to convey the conclusions he had drawn. He said that all the things in each story had happened but not in that order or even on the same day or at the same event. In other words, his story was a fictional tale

drawing on real events. I found it hard to accept that this was research because it felt like reading a novel. Did it convey what the participants had wanted to convey, or unwittingly conveyed despite the author changing so much? Or did it convey what the author wanted to convey having been moulded to his convenience?

At that time, I argued that this rearrangement and fictionalisation of the story is not research but what a novelist does. My best friend is a novelist. She writes fiction. She reads up on the background, living for several months in the city where she intends to set her work. She draws on her personal experience and fictionalises it. She is not calling herself a researcher, but a novelist. She is telling a story that she has made up, yet it is based on research despite the fact that the research is not reported as such. Moreover, the sort of novels she writes give insight into the situations she writes about.

In her Reith lectures, Hillary Mantel (2017) described how she spends a large amount of her time in libraries reading about and gaining knowledge about the historical figures who feature in her novels. She uses the knowledge to bring her characters to life and to set them into the history that we all already know. Yet she was adamant that she is a novelist, not a researcher. Having read her books, I now know far more about what went on in Tudor times. Whilst Mantel may not be reporting facts factually she has enabled me to understand, for the first time, the history of the era. She made history not only accessible, but interesting. As a result, she has drawn me into something I previously had no interest in.

My original difficulty was, what is the difference between work presented as fiction and work presented as research if both are in narrative form? When I read either, the result is the same i.e. bringing alive a situation through the eyes of the novelist or researcher which allows me in turn more insight into that situation. Perhaps the only difference is whether the writer chooses to make the research process visible or not. Mantel has wrapped the “orange research” of her novels underneath where it cannot and will not be seen, whilst researchers are proudly wearing their “orange research” on the outside, not only allowing this to be seen but actively describing the research process as well as “communicating the participants’ realities to a larger audience” (Wang & Geale, 2015, p. 195) through use of narrative. Hannula (2003) believes that both different forms of writing are acceptable, as long as the reader is aware of the nature of the text.

I seem to have convinced myself that fictionalised accounts based on research are a valid form of research as long as the process by which the fictionalised account was arrived at is made, as suggested by Hannula (2003) completely clear. However, I feel more comfortable

with reporting the narrative accounts in a more direct manner. Looking forward to the ethics section (chapter 7, pages 89-96) this issue is important as I had to consider whether to fictionalise another narrative, which I called, Teresa's Tale.

5.5.3 ….. narrative validity

Winter (2002) thinks that the relationship between narratives in social research and fiction such as novels is complex. He suggests that, rather than asking whether or not the narrative, in whatever form, is true one should ask whether it is trustworthy; does it enable us to see similarities with other situations. He goes on to consider whether the nature of validity of qualitative research is residing in its authenticity and trustworthiness. These are issues that I address in chapter 6 (section 6.1.8.1, pages 81-87), when considering thematic analysis and the validity of qualitative research in general. Thus, it seems that the criteria for assessing the validity of narrative research are the same as for qualitative research in general.

5.6 Looking …

5.6.1 … forward from then

Having undertaken two different types of pilot studies, firstly cohort analysis using themes and, secondly individual analysis using narratives, it occurred to me that it would be interesting to combine both approaches by looking at the intersections between the two. By this, I mean like a woven cloth, which has a warp and a weft i.e. two different directions in which the threads travel. The threads are separate but, for a moment, touch a thread going at right angles. It is the intersections that makes the cloth whole.

Consider thematic analysis as the warp direction and narrative inquiry as the weft direction. When I have created some narratives for individuals, weft threads, how do they interact with the themes, warp threads? If I find an interesting theme, I can re-address their narratives to see how individuals deal with that theme. Vice-versa, if I find an individual's big-N narrative is interesting, I can contrast it with the cohort findings.

By "interesting", I mean some aspect that catches my attention. This could be a new idea that I have not previously considered, or perhaps encountering a different viewpoint which sheds new light on some aspect I had previously considered.

Considering the data from two directions builds in a self-checking mechanism, confirming or contradicting interpretations made already.

5.6.2 … back from now

Looking back to the start of writing the story of this research journey, I have been writing a narrative in my voice(s). I believe I am using several different voices as I write.

I am the narrator of the whole story. I have a storytelling voice which links a sequence of events and experiences together.

In my reflective voice, I stop and look back as I tell the story, assessing how my thoughts and opinions have changed as I go through the process.

Sometimes I am stating facts, e.g. chapter 2 (pages 9-17) where I describe how the MEC course came into being. Is this another voice to my story and my reflection? I think it is my factual voice.

In section 5.3 (pages 53-54), I began by saying I use the researcher's authoritative voice, which I subsequently altered to be an amalgam of the researcher's authoritative voice and researcher's interactive voice. So I have four, or maybe it is three, voices in this writing. I am not sure if my researcher's voice is the narrator's voice or a new voice. I am making the "orange" research process explicit alongside telling my story. This voice is not my factual voice, it is decisions based on facts and personal choices.

5.6.3 ... forward and back now

I have struggled with the issue of time whilst I have been writing now. I am writing using a timeline approach, which shows up what I did that went wrong or had to be changed or how a decision was arrived at. It seems to me that most research reports the finished product at the end of the process. I have struggled as I am writing with the fact that, in the intervening time since I took decision X and did action Y, I have gained more or different insight and perhaps would not do the same thing in the same way now. As a result, I have been attempting to separate out the 'then' and the 'now'. It is not a perfect system but has allowed me to overcome a significant barrier to being able to write this thesis at all.

When I studied narrative originally, I focused on voice and did not fully consider other aspects of narrative as a research tool. I am now aware that time is an issue in narrative, and so I shall take a look below at the idea of Narrative Time.

Baynham (2003) talks about the difference between the narrated "then-and-there" and the narrating "here-and-now" being apparently straight forward. He refers to philosophical debates about the nature of time dating from ancient Greek times to the present day. From which I see that even on a basic level we refer to events taking place at a fixed time, but also use time in a relational manner in terms of a sequence of events occurring in a specific order. Baynham (2003) communicates the idea of subjective time, the sense of time passing for an individual, and of time given by a clock or calendar, which I would then call objective time. He also links time with place as in "then-and-there" or "here-and-now". For Baynham (2003) time does not standalone. He gives examples of how it is linked by the narrator to themselves, their families and the places where the events they describe occur. Hence, I would concur with his view that narrative time is far from straightforward. Whilst Baynham (2003) suggests that time is the organising principle of narrative he does not give an indication that helps me to deal with time in narrative.

Brockmeier (2000) describes time as "elusive" and "ubiquitous", which is exactly what makes it so hard to deal with. He describes how we live life forwards but reflect on it backwards and names this as Autobiographical Time. However, as he points out, remembering is a reconstruction of the past. To make things more complicated, there is no fixed point from which to look back since time is always moving forward. This means that when I am saying "now" every occurrence is a different "now" to the previous one. Brockmeier (2000) says, "what happens in the autobiographical process is an interplay of positioning possible pasts and possible beginnings in the light of the end, that is the story at that time, and in the context of its telling." (p. 55), which I consider sums up exactly the issue I have been struggling with. It says to me that I can only start where I start, end where I end and tell the story I am telling in the context I am in.

Brockmeier (2000) considers different ways of, or models for, looking at Autobiographical Time: linear, circular, spiral, fragmentary and static.

The linear model progresses through time from the beginning to the end. He gives examples, such as CVs, to illustrate the linear model. It is a sequence of nows each following each other. I have my own description of novels that follow a linear model. I call them "and then" stories. They are stories where there is usually no sense of the protagonist as a person, an

event happens and then another and then another …. the end. I have tried to insert a central timeline of “and then”s into this thesis, giving a backbone to the story I am telling.

My understanding of the circular model is as if the linear model has wrapped around so that the beginning and end are at the same point. This makes sense to me by imaging a question such as, “Why am I a mathematician?” The end is known, i.e. I am a mathematician. I could tell different stories that illustrate why, with different starting points, but all are told now.

The spiral model is like the circular one but with a repetitive nature i.e., events repeat themselves in a very similar manner. I can identify an example of this in Lila’s Log. Lila twice had an event occur that caused her to reassess her focus onto the MEC, with a sense of history repeating (section 5.4. pages 54-65).

The static model is usually where one single catastrophic event has occurred that means the individual always returns to this point as it emasculates all other events. The example given by Brockmeier (2000) is of the holocaust. With the idea of narrative critical events, this is perhaps a “Big-C” (my term) critical event, as opposed to Lila’s critical events which, I imagine, would be returned to at times but not in such a life-defining manner.

The fragmentary model is given as a post-modern model, which sees life as a series of random events. I think the closest I can get to describing the fragmentary model is as a series of standalone moments. For example, I was once part of a play called 24 Hours. The play consisted of 24 ten minutes episodes, each one occurring as the clock struck the next hour. Each showed ten minutes of somebody’s life. You did not know what had occurred before and could only guess what would happen after. The bell rings – now it is the next hour and the next person. They were not connected to each other, other than via the linear time of the clock, yet they gave a view of life in the 21st century.

It appears that narrative time can be considered in a range of different ways. Brockmeier (2000) himself suggests that the different models often overlap as people’s lives consist of more than story told in more than one way. According to Brockmeier (2000), “The autobiographical process does not follow chronological time but creates its own time, narrative time” (p. 59). It seems to me that I simply have to be brave and create my own narrative time in the telling of my research story and so I will continue with labelling now and then as have I have been doing.

5.7 Conclusion

In this chapter, I have explored narrative analysis, paying particular attention to the concepts of voice and time. This has allowed me to partially tackle the difficulty I have been having with writing a timeline. It has also given me a way of looking at individuals and cohorts at the same time using the idea of a warp and a weft direction (section 5.6.1, pages 68-69). Analysing Lila's log has also led me to the idea of narrative critical events (section 5.4.3, pages 57-60).

In the next chapter, I readdress my research design, incorporating both the warp and weft structure and also narrative events.

Chapter 6: Next steps in research design: Warp and weft

Having undertaken my original pilot studies, described in chapter 4 (sections 4.3 & 4.4, pages 35-45) and trialled narrative analysis, described in chapter 5 (section 5.4, pages 54-65), I returned to trying to define my world view and hence my methodology and ethical stance, producing what I hoped would become a cohesive research design via an assignment (Stansfield, 2013a) as part of the Doctoral program.

In this chapter, I summarise said research design by reviewing that assignment.

6.1 Initial research design

My pilot studies took a thematic analysis approach to interrogate cohort data (sections 4.3 & 4.4, pages 35-45) and a narrative approach (section 5.4, page 54), interrogating data on an individual case level. As a result of these trials, I was fairly certain of what I intended to do next. Having begun to see the cohort data and individual narratives as providing different perspectives on the same data, I planned to lay them across each other like a woven cloth with cohort data in the warp direction and narratives in the weft direction. In a woven cloth, the pattern arises from the interplay of the different coloured threads, which is richer and more interesting than the original threads on their own. I hoped to see patterns arising in a similar manner at the crossing points. I fully described this design in an assignment (Stansfield, 2013a).

The poster below was created as part of the assignment to summarise my thinking and help to draw together my research design.

Figure 1: Poster produced for philosophy module assignment (Stansfield, 2013a).

As is apparent from the poster, my research design was still a work in progress. However, having read widely exploring ideas, taking the time to stop and focus on research design enabled me to crystallise and coalesce my thoughts. I realised that my proposed design was workable, whilst at the same time needing significantly more work to make it into a viable and consistent plan. I was thus able to move forward and address the gaps in my design.

The poster gives a summary of how I intended my research design to look. It draws on and summarises the work I have done in previous chapters (chapters 1-5, pages 5-72) of this thesis.

Here, I will reflect on how the design I propose on my poster differs from my original ideas (chapter 4, pages 31-48). I will refer to the poster to describe my research design from then, and at the same time highlight those areas that still needed more work.

Since the text size makes the poster difficult to read, and I refer to the boxes in a way that makes sense when reviewing the design rather than how they are laid out in the poster, the following table (Table 1) restates the information and numbers the boxes to make clear which order they will be referred to below.

Box 4: Research Question How do students' perceptions of assessment change over the course?	Box 3: Aims and Rationale I wish to have more awareness of how students perceive assessment in order to better understand what obstacles to engagement with assessment may exist. My interest arose from one particular student a few years ago who strongly felt that one particular task was not "valid".	Box 5: Philosophical background NOT a realist. I believe reality exists but it is fluid and changes shape each time we interact with it. We know it through being part of it hence can never look at it objectively. We each construct our own view of reality based on experience, links to Dewey's ontology of experience; narrative enquiry is based in knowledge as experience. Currently reading: Brent Davis (enactivist); Clandinin (Narrative enquiry); Damasio (embodied cognition) People to read: Merleau Ponty; Dewey; Maturana; Varela (phenomenologist -> enactivist)
Box 6: Methodology I will be using a largely narrative approach based around large and small stories gathered from the students via as many means as possible. Definitively qualitative (not enough participants to analyse quantitatively anyway). I intend to use 2 main perspectives on the data: a narrative approach to focus in-depth on individual case studies but also to cross the grain by looking for commonality and difference between participants. Currently reading: narrative enquiry resources from the narrative module	Box 2: Context is on many levels: 15-20 post-grad students learning maths in order to progress to teacher training. Differing ages and backgrounds. Or: it's my workplace, and I am their tutor. Or: context is set within the existing literature and theories on assessment (Paul Newton; Black and Wiliam etc). Or it's within the participants narrative; Complex.Can't claim any generalisability, although other MEC tutors and people with an interest in assessment may well find it useful.	Box 7: Ethics request informed consent for questionnaire and interviews; ensure its clear these are for research purposes only and are NOT used on the MEC; ensure anonymity; right to withdraw at any time by providing my contact details on form as well as my supervisor, and gather their contact details in case they would like to read published material. Provide participants with a copy of their completed form. Similarly it is also important that the course documentation is allowed to grow naturally and serve the purposes of the course in all respects, i.e. that my research interest does not cause distortions. Therefore I will request permission for use of course documentation at the end of the course and will not begin analysis of it until then.
Box 8: Methods I intend to use open question questionnaires in order to gather data from all participants this will enable me to go across the grain as well as to identify interesting individuals to interview in-depth; naturalistic interviews (for a few) attempting to get participants to talk with as little intervention from me as possible; learning journals; assessment feedback; tutorial records; ad-hoc anecdotes.References: Cohen and Manion; Silverman; Mason etc.	Box 1: Working Title An investigation into students' perceptions of assessment on one Mathematics Enhancement Course	Box 9: Data Analysis thematic analysis of whole cohort based on Rapley (in silverman) and narrative analysis of case studies. Currently scouring qualitative methods books searching for clear descriptions of these in more specific and detailed forms.

Table 1: Clear version of the poster in figure 1.

I will start by considering each box on the poster, one at a time, linking it to chapters 1 through 5 of this thesis.

6.1.1 Box 1: Working title

"An investigation into students' perceptions of assessment on one Mathematics Enhancement Course" has been my working title from the outset. In previous chapters, I explained why I wanted to know more about how my students viewed and engaged with assessment. Thus, the title is a fair presentation of my original aims. When I made this poster, it was still a good description of what I anticipated working towards. However, I was aware then, and more so now, that it is a working title. I have always been happy to allow my work to morph and change and I believe that, in fact, the title is the last thing to decide since it needs to be a succinct summary of what the writing is about. Therefore, I did not allow myself to be constrained by the title. More than anything, it exists because others expect it, rather than because I need it. As I write now, looking back, I know for sure that the title will be changed. I will address why in chapters 9 onwards. But at the time of the poster, it was still a good working title to move forward with.

6.1.2 Box 2: Context

When I made the poster, I was unclear about what I meant by context and listed several possibilities. As a result of the poster creation and my reflection on it, I began to see context to be on three levels. As described in chapter 2 (pages 9-18), the then current national situation is the top level, within which my MEC was embedded (middle level), whilst at the bottom level were my students.

Since I was working in the context of my MEC and my students, I felt that I could not claim any generalisability. However, my work would be of interest to other MEC tutors. When the course was originally set up, there were many opportunities arranged for MEC tutors from across the country to get together to share their experience of working in that environment. Although these organised events decreased as the courses became more established, there continued to be a tendency to meet and discuss at various conferences such as AMET or BSRLM. I therefore knew that several people were interested in the work I had done on feedback and were also interested to know more about this project, looking at perceptions. It is not so much that my work is generalisable, more that other people working in similar contexts can compare with their own situations.

6.1.3 Box 3: Aims and rationale

The box contains the text

> I wish to have more awareness of how students perceive assessment in order to better understand what obstacles to engagement with assessment may exist. My interest arose from one particular student a few years ago who strongly felt that one particular task was not "valid".

which remains an accurate summary of my aims and rationale for undertaking this work, based around my initial conversation with Geraldine (section 2.3, pages 12-16). More detail, which I feel sufficiently explains why I am doing what I am doing is in the previous chapters, in particular chapters 2 and 3 (pages 9-30).

6.1.4 Box 4: Research question

My original research questions were

> "What do students perceive as being a *valid* assessment of mathematics?"

and

> "How did these perceptions arise and how do they change?"

(section 4.3.1, page 35).

I had refined my research question vis-à-vis the original to:

> How do students' perceptions of assessment change over the course?

It is simpler whilst allowing room for manoeuvre and response to unanticipated issues as they arise. I anticipated raising more questions as I made progress, intending to plan how to address them as they arise. For example, in my pilot study I raised the following questions:

> Is there a difference between reliance on correct answers and reliance on marks?
>
> Who decides if an answer is right?
>
> What is meant by reliance on teachers?
>
> How does reliance on teachers contrast with self-help?

(section 4.3.7, pages 41-42), which will need to be addressed as my plans move forward.

With hindsight I feel that allowing "wiggle room" fits with an enactivist theoretical perspective (box 5 – section 6.1.5 below). Thus, I can wait and see what would emerge with no preconceptions rather than be confined to answering a specific question.

To summarise the first four boxes, I was happy that my work had a good foundation on which to build and I had begun my research design based on solid foundations. However, the research design itself still needed more work, which I will explain as I address the remaining five boxes.

6.1.5 Box 5: Philosophical background

On the poster, my philosophical background is not securely defined. It shows what I am not, rather than defining what I am. I talk about flexible and fluid interaction with the environment, which is moving towards enactivism (sections 8.4.& 8.5, pages 101-108), but at that point in time I was still a long way from positively labelling myself as anything in particular.

Previously, (section 4.2, pages 33-34 & section 4.3.2, pages 35-36), I stated that I am a constructivist, largely taking it for granted that it is understood what is meant by constructivism. I was beginning to read more widely but still had not managed to fully identify my ontological and epistemological viewpoints (section 4.3.2, pages 35-36) and hence I was refusing to be labelled! Looking back now. It is clear to me that I was labelling myself constructivist at the same time as becoming more aware of the role of experience; in some part through my engagement with narratives ideas (chapter 5, pages 49-72). My amorphous ideas had not yet crystallised into a definite shape.

I had also begun to read around the idea of enactivism (e.g. Damasio, 2006; Maturana & Varela, 1998; Reid, 1996) and complexity theory (e.g. Cohen et al., 2011; Davis, Sumara & Luce-Kapler, 2000). I saw myself as enactivist, in that we interact with the world and respond to it through unique and individually learned automatic responses, which are a direct result of our own experiences, thus linking to the idea that there is no objective single “truth”, there are only individual truths (Clandinin & Rosiek, 2007).

At the time of the poster, I had some idea of what I was (constructivist and enactivist) and it was beginning to feel “right”, without fully appreciating how much I did not know. But, I did know that more clarity was needed about: what I mean by enactivism; whether I could be constructivist and enactivist at the same time; and whether I even was enactivist. Hence, an aim at this review point was to read in more depth around enactivism.

It has taken a long-time to come to understand, and hence identify, my philosophical perspective. I address this in chapter 8 (sections 8.1, 8.2 & 8.3, pages 97-101) where I

explore why I thought I was constructivist; what is enactivism and why have I moved from one to the other.

6.1.6 Box 6: Methodology

In the poster, I am not clear about what methodology means. I wrote about the methods I would be using rather than about methodology. Looking back this feels inevitable because if I cannot define my theoretical perspective, I have little chance of being able to describe how I will work as a researcher within that worldview. However, now I think my intention to work in an enactivist manner is clear, despite the fact that, then, I did not understand what enactivism really meant.

At the time of the poster, I had decided to work in a cyclic manner analysing the warp direction to draw out cohort wide themes, then in the weft direction to identify what is important for individuals, then contrasting with the cohort as a whole. I hoped to gain insight into students' perceptions, which could lead to a deeper understanding by repeating this cycle as many times as necessary.

As with the philosophical background, it has taken me a long time to understand what is meant by methodology. However, then, I did not know that I did not know. Since I was happy with my description I did not, at that point in time, set myself any targets regarding methodology.

I have subsequently addressed methodology (section 8.5, page 108), as a result of refining my philosophical background (sections 8.1, 8.2 & 8.3, pages 97-101).

6.1.7 Box 7: Ethics

Back then, I was also happy that I had addressed ethical issues in sufficient detail. It later became clear that, up to that point, I had not addressed ethics in any depth at all. By cherry-picking from British Educational Research Association [BERA] (2011) guidance, and as can be seen from the poster and chapter 4 (pages 31-48), I initially considered that anonymising the data would give sufficient protection to the participants. I also ensured that the participants knew they had a right to withdraw, giving them a copy of their signed form to keep, which included my contact details and those of my supervisor.

Whilst working on the pilot studies, I was increasingly aware of the fact that all the data I was using was "live" course data, which I needed to use as a tutor without disturbing the natural flow of the course (Cohen et al., 2011). As John Mason (2002) points out, there is a grey area between improving practice and undertaking research. I decided to try and minimise any effect I may have on participants as a researcher by only asking for permission to use data at the end of the course, when the students would be aware of exactly what documents I wished to use. Therefore, I could only begin analysis at the end of the course. I also decided to ask for permission for each data source separately, so that they could allow access to some and withhold it for others.

However, at around the same time as I created the poster, I was attempting to analyse another narrative, which I called Teresa's Tale. Teresa's Tale led me to understand that, whilst I had taken an ethical stance, it was insufficiently robust. Since the poster and Teresa's Tale were almost concurrent, the ethical issues that arose from Teresa's Tale took precedence in my mind over what appeared to be more mundane issues that I thought could be sorted easily. New ideas about what is meant by an ethical stance were beginning to emerge for me, hence the next chapter (section 7.2, pages 91-96) is addressing the ethical issues arising from Teresa's Tale.

6.1.8 Box 8: Methods

The methods I was using in the pilot studies were, and I believe still are, appropriate methods for my purposes. I had trialled thematic analysis (sections 4.3 & 4.4, pages 35-45) in the warp direction and narrative analysis (section 5.4, pages 54-65) in the weft direction, finding useful information. I was using a generic form of thematic analysis, which did enable me to look at what was occurring across the cohort. However, it may be that I could fine-tune thematic analysis methods used in the pilots. I therefore consider this below (section 6.1.8.1, pages 81-87).

In the pilot studies, I used individual interviews at the end of the course, as well as embedding questions into group tutorials, partially as a way of checking that I was using the participants' responses as they had intended. This could be considered as a form of member checking, which Cohen et al. (2011) describe as confirmation by respondents. In the pilots, I briefly considered researcher bias (section 4.5, pages 45-46) and research validity (section

5.5.3, page 68). Member checking could be seen as one way of avoiding researcher bias and ensuring validity of the research

I had not previously thought about the real purpose of member checking, I had simply followed advice from a textbook to do it. This seems a suitable point to address this shortcoming, especially as over time the reading I have done on validity in assessment (section 3.3, pages 23-29) has infiltrated my brain and made me wonder how people will judge this thesis. After all, it will itself be assessed when it is finished! I address validity in qualitative research below in section 6.1.8.1.

6.1.8.1 Refining thematic analysis (or not) and considering validity in qualitative research

In general, qualitative researchers, such as myself, are trying to understand something particular from the point of view of another individual (Vaismoradi, Turuuren & Bondas, 2013). I am trying to see how my students view assessment.

Gergen and Gergen (2003) refer to a "crisis of validity" for qualitative research, because if meaning is based on interpretation, there is no one-to-one match between interpretation and the world. Hence, the right to claim "scientific" validity is lost. Creswell and Miller (2000) list a plethora of terms that are used for validity in qualitative research, such as plausibility, authenticity, trustworthiness. However, it is the idea of validity that is important rather than the word used to describe it. So, if scientific notions of validity cannot be used, I must demonstrate validity in different ways.

It is accepted that competence and integrity should be demonstrated in all research. In particular in qualitative research, where replication is less easy to attain than in research that follows scientific methods (e.g., Creswell & Miller, 2000; Lincoln & Guba, 1985). Fereday and Cochrane (2006) believe that competence and integrity can be demonstrated by, firstly, choosing appropriate methods backed up with a sound argument. Data interpretation should retain excerpts from the participants to ensure it remains linked to the participants' original words and the resulting description should give a "plausible" and "authentic" account.

In my pilot studies, I used a loosely defined form of thematic analysis. Fereday and Cochrane (2006) agree with Aronson (1995) that when interpreting data it is important to look for themes or patterns of experience. Birt, Scott, Cavers, Campbell and Walter (2016) express concern that the researcher's voice may drown out that of their participants. They therefore suggest member checking as a way to ensure this does not happen. However, whilst supporting the idea of member checking, as suggested by, for example, Aronson (1995) and Birt et al. (2016), Fereday and Cochrane (2006) caution that the participants may be responding to the interviewer's interpretation rather than their own meaning. I used end-of-course interviews and group tutorials to check the students' view of my interpretations, which I thought of then as a form of member checking. This was a naïve point of view on my part, simply thinking that if the participants agree with my interpretation they are giving validity to the project and everything is fine. I now understand that the situation is far more complex and nuanced than this.

In the sections below, I am looking at my use of thematic analysis, member checking and validity of qualitative research more generally, from a more informed position than I had at the time of the pilot studies.

Thematic analysis

There is general agreement that it is difficult to define thematic analysis (Attride-Stirling, 2001; Braun & Clarke, 2006; Buetow, 2010; Rapley, 2011; Vaismoradi et al., 2013). Indeed, Vaismoradi et al. (2013) say that thematic analysis is often not well "branded", but that it does allow the researcher to interpret meanings within their context. However, Braun and Clarke (2006) do consider thematic analysis to be an effective and flexible method in its own right. There are underlying principles that all agree on, in that the material needs to be coded in some way and the themes extracted. From this point of view, I do not feel the need to be more prescriptive than I have been so far, in terms of performing the thematic analysis. What is of more interest to me now is how I represent, interpret, analyse and present the information. But before leaving this point, I should note that I have said the themes are extracted, rather than the themes emerge. Although both words, extract and emerge, contain an implication of the themes existing for me to discover, I believe

that the themes I identify are based on my perspective and are not necessarily the only way the data could be coded and categorised.

So far, I have looked at the most prevalent of the themes identified, and also at individual perspectives, where I have focused on the prevalent themes. I am now considering how I can make best use of the data at my disposal. I agree with Vaismoradi et al. (2013) that the set of themes identified needs to capture "something important in relation to the overall research question, and represents some level of response pattern or meaning within the data set" (p. 402) and that this is more important than quantifiable results. So, is use of the most prevalent themes the best or only way to look at my data?

Braun and Clarke (2006) are clear that it is not prevalence that makes a theme important, rather it should represent some sort of patterning across the data. I agree this is important. For example, in my own findings feedback has become more important to the students after attending the MEC. However, Buetow (2010), whilst acknowledging this, focuses on codes that do not recur. By definition one occurrence cannot be thematic, such as an example from one of my pilots where "fear" felt important but was mentioned by one student only (section 4.4, pages 43-45). Moreover, as described in chapter 4 (section 4.3.3, pages 35-43) one voice can speak for many. If that one voice is ignored, an aspect that is highly important to the research may be lost. Or indeed, as Cohen et al. (2011) highlight, the one-off event could be all that is needed. As they point out, it only takes one murder to be a murderer!

Although I have decided (section 4.5, pages 45-46) that I am not in fact carrying out case study, Yin's (2009) work on case study adds some useful descriptions when it comes to selecting individuals for study. Yin suggests five reasons for choosing a particular case study. These are: the "critical" case where a single case can "represent the critical test of a significant theory" (2009, p. 48); an "extreme" or "unique" case, which would be selected if it illustrates a rare situation; an "average" case, which can illustrate a "typical" situation; a "revelatory" case, which allows the researcher access to some new situation; or a "longitudinal" case, where some cases are studied at different points in time to look for changes. In my opinion, these are not mutually exclusive categories. For example, I am gathering data across the duration of the course with the potential for interviews beyond that point. At the

same time, I intend to select individuals who give differing perspectives on the students' assessment perceptions.

Buetow (2010) suggests using saliency analysis to enhance thematic analysis. By this he means that each code is designated as highly important and recurrent; highly important but not recurrent; not highly important but recurrent or neither highly important nor recurrent. Thus, he says we can keep a focus on what is important rather than simply what occurs most frequently. I am in favour of keeping the importance of ideas that are only raised by one person, although for my purposes I feel that it is probably more appropriate simply to have an awareness of these single instances without the need to try and label importance.

Attride-Stirling (2001) suggests using Thematic Network Analysis. In this model, themes are gathered together into small groups of themes of a similar nature, thereby leading to what Attride-Stirling (2001) calls "Organising Themes". It could be that these then form even higher level "Global Themes". This sounds like a good model, where many different themes have been identified. Once the network has been constructed, the researcher can return to the original data and interpret it using the network as a frame. Thus, the data is considered not in terms of its prevalence but rather in terms of its interconnectedness and can be viewed from the different perspectives of the "Organising Themes". However, whilst the themes I identified do appear to loosely group themselves, I did not think I had enough themes to use this idea of clustering in a major way. Although I did consider whether to group my themes into two groups, namely internal and external factors. I did not progress this idea then, but I return to consider it having performed my final narrative analysis in chapter 11 (pages 129-164).

With hindsight, I see Attride-Stirling's (2001) consideration of themes on three levels as parallel to Tannen's (2008) idea for classifying narratives as small-n, Big-N and Master narratives (section 5.4.5, pages 61-65). Hence, it could prove to be a useful way of giving a similar structure to my warp and weft threads.

Both Attride-Stirling (2001) and Vaismoradi et al. (2013) seem to be suggesting that some sort of visual representation of the themes is useful (a network or a map). I like the idea of being able to see the "shape" of the data in some way that allows it to be inspected from different perspectives. I do not yet know if I will use this idea, but it is

possible I could draw a grid showing the three tiers from the warp direction intersecting with the three tiers from the weft direction in order to look for similarities and differences.

Member checking / ensuring validity of this research

Returning to member checking, there is a debate over its effectiveness. Whilst most people appear to agree that member checking is a good thing (e.g. Hallett, 2013), Carlson (2010) suggests that the novice researcher (such as myself as I set up my pilot studies) may fall into various traps if they are not sufficiently aware of what they intend to achieve through member checking. Hallett (2013) discusses this issue in more depth citing several possible problems.

Giving participants back raw transcripts can lead to a variety of responses, ranging from them changing everything they said, to feelings of embarrassment at their poor grammar, for example, or, conversely, lack of awareness of poor grammar meaning they want nothing changed. However, their peers may think badly of them if they see the final work. It is, therefore, conceivable that data will be withdrawn or changed in such a manner that it will be of no use to the project. So, how member checking is carried out needs to be considered in advance to avoid losing data, whilst at the same time considering possible harm to participants, both of leaving potentially identifiable data in, and also of the form in which participants see the data, e.g., should raw transcripts be smoothed first?

A second issue is whose view should take precedence if there is a difference of opinion, that of the researcher or that of the participant? Varpio, Ajjawi, Monrouxe, O'Brien and Rees (2017) argue that it is often the case that the researcher's view should take precedence because they have access to the whole dataset. A participant will usually only have access to their own data, which they are likely to view subjectively (Birt et al., 2016). On the other hand, privileging the researcher's view can lead to conflict between the two parties (Hallett, 2013). In chapter 5 (section 5.3, pages 53-54) I described myself as using the researcher's authoritative voice and the researcher's interactive voice, in that I interpret the participants' contribution based around my interest in their data but also reflect on my own voice and interpretations. Thus, I am taking a stance in line with Varpio et al. (2017) and Birt et al. (2016) rather than that of Hallett (2013).

Stake (1995) says member checking rarely adds anything useful, however, he does allow that it is necessary. More recently, Thomas (2017) reports a lack of evidence that member checks improve research findings, although he does allow that it may be useful for specific purposes. For example, he suggests that, in situations where it is difficult to ensure anonymity, member checking can be used to gain permission for specific quotations to be used. In other words, as Cresswell and Miller (2000) stipulate, member checking should be done in a manner that fits the lens through which the research is created. However, other strategies to ensure validity maybe more appropriate (Hallett, 2013).

Member checking is just one method through which validity of qualitative research can be established. Creswell and Miller (2000) describe nine "validity procedures".

Paradigm assumption/Lens	Postpositivist or Systematic Paradigm	Constructivist Paradigm	Critical Paradigm
Lens of the Researcher	Triangulation	Disconfirming evidence	Researcher reflexivity
Lens of Study Participants	Member checking	Prolonged engagement in the field	Collaboration
Lens of People External to the Study (Reviewers, readers)	The audit trail	Thick, rich description	Peer debriefing

Table 2: Validity procedures within qualitative lens and paradigm assumptions (Creswell & Miller, 2000, p. 126).

My viewpoint lies within the constructivist and critical paradigms (section 6.1.5, pages 78-79), in which case, Table 2 implies that member checking may not be the most appropriate method for ensuring validity anyway. My take, on its position in this table, is that member checking, whilst involving the participants, is perhaps an attempt to add scientific method to qualitative research, rather than a truly qualitative method of ensuring validity. Indeed, I no longer believe I was truly engaged in member checking. I did not give the participants their data and my interpretations to comment on individually. Rather, I was using their responses for further discussion through my role as tutor, which, in Table 2, I would place as "Prolonged engagement in the field" or "Collaboration", since in both the group tutorials and the end-of-course interviews I was attempting to get behind their meanings and clarify my themes from the participants' viewpoint.

By positioning myself as using researcher's authoritative voice, I am placing more emphasis on using the Lens of the Researcher than on the Lens of the Participant, whilst wanting to remain "true" to the participants' meanings. Whilst the researcher's interactive voice seems to me to be essentially the same thing as researcher reflexivity.

6.1.9 Box 9: Data analysis

I described the results of data analysis from my first pilot in chapter 4 (section 4.3.7, pages 41-42), but without any detail as to how the data analysis was performed. I will therefore add some missing detail here.

In the warp direction, I will continue to use a broadly-based approach based on thematic analysis to analyse the cohort data. I will be following the advice of Rapley, who advises "being prepared to be led down novel and unexpected paths, to be open and to be fascinated." (2011, p. 279).

Rapley (2011) recommends 4 stages to perform thematic analysis:

1) Familiarisation with the data
2) Create an initial set of codes/themes systematically
3) Code data using themes
4) Reflect on the process and refine the above.

At the same time, I will bear in mind the advice of Buetow (2012) regarding ideas raised by a single person.

Having created a set of themes, I originally planned a member check by asking participants to use my themes to code their responses, however, in hindsight I am now rejecting this idea for the reasons given in section 6.1.8.1 (pages 81-87). I will continue to use end-of-course interviews to probe more deeply into participants meanings and my own reflections on the process.

In the weft direction, I will analyse the reflective logs and other sources to which I am given access in the manner described in chapter 5 (pages 49-72).

6.1.10 Reflection on poster review

As I progress with this writing, the timeline is bringing me closer and closer to now, and it is getting harder and harder to separate out my thinking then and my thinking now. This chapter is a mixture of work I did then and thinking I have done in a different now.

It is obvious to me now, looking back, that at the time I made the poster I had insufficient awareness of many issues for creating a really well-thought-out research design. Yet the structure and timing of what I expected to do on the PhD course was forcing me to create a research design. It is impossible to say how long it would take to have sufficient awareness, and indeed I would say that no amount of time is sufficient as each new experience causes a re-evaluation of past experiences and possible new insights. Despite the timing of this point in time being arbitrary, it allowed me to confront my emerging ideas and attempt to justify them. In doing so, I discovered many aspects that needed to be readdressed in more depth, such as thematic analysis and member checking (section 6.1.8.1, pages 81-87) through to my underlying philosophical and ethical stance, which I address in the next two chapters.

My aim at the time was to refine the emerging design and tie it down in order to begin work, but it was not that simple and despite working hard to achieve a cohesive design, ultimately I had to start again. But that is in the future (chapter 9, pages 111-116).

6.2 Concluding reflections

In this chapter, I have reviewed my first attempt at a research design. This has shown that I am collecting relevant and useful data and that I have methods of working with the data that are yielding some insights. However, unless I am able to articulate my philosophical standpoint and methodology, I cannot anchor the work I am doing. Similarly, I had a naïve view of ethics which I knew I needed to strengthen. Hence, in the next chapter (chapter 7, pages 89-96) I explore the need for a strong ethical background in depth, whilst in chapter 8 (pages 97-110), I discuss how and why I changed from viewing myself as constructivist to being an enactivist.

Chapter 7: Ethical considerations: Review and improvement

In the previous chapter on research design, I identified that my then current ethical view during trialling thematic analysis (chapter 4, pages 31-48) and narrative analysis (chapter 5, pages 49-72) was insufficiently robust.

In this chapter, I will discuss how my ethical stance evolved and developed. I start by considering guidelines on ethics, continuing by drawing on the issues that arose when considering a second narrative, Teresa's Tale, in order to reconsider the role of ethics in my research.

7.1 Ethical review using BERA guidelines

The Council of the British Educational Research Association (BERA) regularly produces a set of guidelines for researchers to follow. This was my starting point to ensure I covered all ethical aspects that are considered important within the education research community. I followed the advice given in the BERA (2011) Ethical Guidelines, as this was the most recent version available at that time. My consideration of my responsibility to participants is given below.

7.1.1 Voluntary informed consent

I gave a short speech to each cohort about my research at the start of the course, making it clear that there is no obligation to participate. I repeated the process at the end of the course, but asking for access to a range of specific documents so that individuals could choose if there were documents they preferred were not used. Copies of the consent forms are included in appendices 3 and 4 (pages 207 and 208).

My participants were students I taught; hence, I needed to be mindful of possible conflicts of interest. Much of the relevant data is course documentation. In my role as their tutor, I was permanently attempting to improve the course and am aware that "there is a fuzzy area, […], between experimenting on people and striving to improve practice by making adjustments" (John Mason, 2002, p. 221). Cohen et al. (2011) advise that seeking formal consent could lead to "a narrow range of data" and "disturb the natural behaviour of the participants" (p. 81). I wanted to collect data that is as natural as possible, but also had a duty, as the tutor to the students, for their learning hence it is in my interest, and that of the students, to proceed purely using the items generated for the purpose for which they are

intended during the course and only request permission for use of the data at the very end of the course. I, therefore, did not begin analysis for research purposes until the course had finished. I included each type of data separately on the form to enable participants to decide which data I may have access to and which I may not.

7.1.2 Openness and disclosure

As described in section 4.3.5 (pages 40-43), I did not share the focus of my research at the outset, as I felt that may affect the nature of information I would receive on the subject. However, I did offer to share this information at the end of the course.

7.1.3 Right to withdraw

In addition to giving some background to the research and how the data will be used when requesting informed consent, I also made it clear that it is possible to withdraw at any time, providing both mine and my supervisor's contact details on the informed consent form. A photocopy of the completed form was given to the participant as well as being kept by me.

7.1.4 Children, vulnerable young people and vulnerable adults

All my students were adults and were not in a classification that one would consider as "vulnerable". However, I was mindful of the need not to cause distress to participants and to minimise the bureaucratic burden on them due to my research. As stated above, it was only at the end of the course that I asked to use existing documentation. Thus, the extra workload imposed on participants was limited to completion of a consent form and a questionnaire (section 4.3.4.2, page 39; section 4.3.5, pages 40-43). Only if they agreed, some participants also took part in an interview which lasted around 30 minutes.

7.1.5 Incentives

I did not consider it appropriate or necessary to offer any kind of incentives to participate.

7.1.6 Detriment arising from participation in research

I assumed that anonymity would be sufficient to ensure that there could be no detriment to individuals arising from participation. I gave each participant a code, which would be used in any writing or discussions. However, this approach proved to be insufficient when I began to look at Teresa's Tale. I will address this in section 7.2 (below).

7.1.7 Privacy

I initially assumed that participants would prefer to be anonymised, and did not consider that some may wish to be identified. I will touch on this again when I consider Teresa in more detail in section 7.2 (below).

All data is kept at home where it will not be chanced upon by colleagues who may know the participants, as are the consent forms.

I am using the data in accordance with my original agreement with the participants. Should I wish to use it in a different way, I would contact the participant to seek permission. If contact were to prove impossible, I would not make use of the data for that purpose.

7.1.8 Disclosure

I have not encountered any issues that would require disclosure, however, if I should, I would return to this guidance and ensure that I follow the then current best practice.

Participants were not required to give contact details, but could do so if they were willing to be interviewed at a future date or would like to be informed of the final report.

7.2 Teresa's Tale: Further ethical considerations arising from a case study

I began by looking at the case of one student, whom I shall call Teresa. Teresa definitely did not fit the pattern of the cohort. Indeed, using Yin's (2009) categories (section 6.1.8.1, pages 81-87) Teresa's tale could be considered as extreme or unique. Her situation was quite individual in many ways. I will not describe that here, however, as she was so individual that to do so would identify her

In section 4.3.5 (pages 40-43) I described my very basic approach to ethics when undertaking the pilot studies. In section 7.1 (above), I described an enhanced but still fairly basic approach to ethical issues. Not having previously encountered a situation such as Teresa's, I had not seen the need for more robust consideration of what it means to behave in an ethical manner. It was only when I attempted to use Teresa's log, in the same manner as Lila's, that I realised that ethics is not just a required section in a research report, but is about my behaviour, interactions and self-awareness.

There appeared to be many critical events (sections 5.4.3, pages 57-60; 5.4.5, pages 61-65; 5.6.3 pages 69-71) in Teresa's tale. I wanted to explore these with her to find out in what ways they affected her views. Teresa had agreed that I could use her data and I could contact her when she had left the MEC to do a follow up interview. Once I realised that telling Teresa's Tale would identify Teresa, I also realised that I needed to explore the idea of anonymity versus identification explicitly with Teresa and could not simply assume that anonymising her was sufficient. This led me to think far more deeply about what it means to behave in an ethical manner.

I reported on this dilemma in BSRLM (Stansfield, 2014) and will summarise my paper in sections 7.2.1 to 7.2.6 below.

7.2.1 Why Teresa?

I picked Teresa because the individuality of her story made her stand out in many ways.

When Teresa joined the MEC she appeared to be a confident self-contained adult, determined to succeed and start a new career as a mathematics teacher. Throughout the course she reported various events that had occurred, to me as her personal tutor, but always gave the impression that she was coping. Through a chance conversation with another student I discovered, fairly late on in the course, that Teresa had not been telling me the whole story. She had not shared details of various issues that were seriously affecting her ability to study and complete work on time, or if she had shared them, she had played down their severity. By this time it was becoming apparent that she was struggling to keep on top of the work and in fact she totally failed to engage in any meaningful way with the final assessment task, a mathematical project on a topic of personal interest.

Having decided that I would use narrative critical event analysis (sections 5.4.3, pages 57-60; 5.4.5, pages 61-65; 5.6.3 pages 69-71) as a tool for understanding students' narratives,

Teresa's decreasing engagement with assessment tasks and the events that had occurred looked as if it would yield rich results for me. I saw Teresa's Tale as a significant part of my final report and was very reluctant to relinquish it when I realised ensuring anonymity would be difficult when such unique circumstance could enable identification. Moreover, if I did go ahead with analysing and reporting Teresa's Tale, Teresa herself may disagree with my interpretations and could then withdraw, thereby wasting my work. In other words, I was initially thinking about what I wanted and not about what Teresa might want. I was seeing ethics as a hoop to jump through imposed by other people, but Teresa's Tale made me realise that I had to engage with the issues, and it was not about what I wanted! Rather, it was about in what ways could I achieve parts of what I wanted to, and if not, accepting that I would have to abandon my ideas and progress without Teresa.

7.2.2 Problems with "anonymity".

Anonymity is, according to Clark (2006) an attempt to protect the participant, disguise the research location and comply with data protection laws. However, as I have discovered, anonymity alone does not necessarily do this. Although it may do in a large study, it is less likely to in a small study such as this. Moreover, there is some debate as to whether identities should be explicit (Wiles, Crow, Heath & Charles, 2008). Yin (2009) goes further, saying that identities should be revealed, whilst some participants want their identity to be known (Clark, 2006; Wiles et al., 2008). Indeed, identities are frequently explicit in narrative research. Clark (2006) recommends that whether to be anonymous or not should be discussed with the individual concerned.

7.2.3 Confidentiality versus anonymity

Anonymity is about disguising the identity of the participants, whilst actually what may be required is confidentiality, which is about not disclosing information or opinions gathered in the research process inappropriately (Wiles, 2012). Wiles (2012) thinks that the two are often confused. Since anonymity, as I have discovered, does not necessarily ensure that the participant's identity cannot be known, it cannot ensure that confidentiality is maintained.

Smythe and Murray (2010) say that participants have a right to expect that steps are taken by the researcher to ensure that no additional harm is done to them as a result of participating in the research, over the normal expectations of everyday life. Moreover, participants should have a clear understanding of how this will be ensured, which would include how confidentiality will be maintained.

It would appear that anonymity is simply one method of ensuring confidentiality. However, having promised anonymity, I would have to work with anonymity unless I could agree a different approach with Teresa.

7.2.4 Maintaining confidentiality

Whilst all reasonable steps must be taken to ensure confidentiality, no system is perfect and accidental breaches of confidentiality occur (Wiles et al., 2008). For example, as I have discussed above, despite anonymity, the information given may identify a participant (Wiles, 2012). Continuing to use information with advance knowledge that this could happen would be unethical.

There may also be situations where harm could occur to the participant and confidentiality must be broken to avoid this. The medical profession, teachers, social workers and so on have clear guidance on situations where they should breach confidentiality (National Society for the Prevention of Cruelty to Children [NSPCC], 2014; Royal College of Nursing [RCN], 2009).

However, there is a grey area. Most people will breach confidentiality when it is clear that not doing so could result in harm to the participant, although they are less likely to report participants breaking the law (Wiles, 2012), often making their decision based on their own morals. But does this mean they are behaving ethically? A question which I address in section 7.2.5 below.

It is also possible that confidentiality is breached by someone other than the researcher, such as another participant, thus revealing the identity of other participants inadvertently. Avoiding anonymity in the first place and identifying all participants could avoid this and force the researcher to confront issues of possible harm to participants more explicitly.

7.2.5 Is ethical behaviour the same as morality?

According to Kimmel (1988) ethical behaviour follows a set of principles and a code of practice, whilst for Wiles (2012) ethics is the philosophy of morality. Taking Kimmel's view, ethics appears to be imposed externally, whilst taking Wiles' view, ethics could be an individual, or internal, construct. Perhaps ethics is an amalgam of both?

Individuals' sense of morality will differ, as will their interpretation of guidelines (Munro & Bragaglia, 2012). Whilst Hammersley and Traianou (2011) think that a strictly moral stance may be inappropriate, such as when researching the motivation of criminals, who may not speak at all if what they say will be reported, for example. Also, a person may follow ethical guidance to the letter and still feel that this sits uneasily alongside their own set of morals (Kimmel, 1988).

Hence, in my opinion, my ethical behaviour must follow a set of rules or guidance which is recognised more widely, such as the BERA Guidelines (2011), but must be linked with my own sense of what is right. This appears to be particularly important when working with individual narratives (Smythe & Murray, 2010). From an enactivist perspective, Varela (1999) believes we respond to such events using "immediate coping" (p. 5), i.e., we take decisions in the moment rather than through rational debate. Therefore, it is important that the researcher is secure in their ethical intentions, prior to interacting with the participants in order that their response is consistent and appropriate in that moment.

7.2.6 Reflections then

The key issue is that no harm should come to Teresa. I promised anonymity through use of pseudonyms in my informed consent form. I discovered that I cannot guarantee no harm through anonymity. I also realised that informed consent is not a one-off event, but an on-going process (Smythe & Murray, 2010; Wiles, 2012).

Since pseudonyms cannot protect a person sufficiently, Wiles et al. (2008) suggest alternatives, such as disguising or omitting some data. However, I would need to omit a lot of

data and disguising it would not be enough to hide the truly unique situation I wished to examine, unless I changed it so much as to obscure the original situation. Moreover, as Wiles (2012) indicates, straying too far from the original may not be acceptable to the participant as it could be seen as lying (Corden & Sainsbury, 2005).

I came to the conclusion that I would either have to drop Teresa's Tale completely, or discuss with Teresa to what extent she would be happy to be identified and what parts of her story I can use, as suggested by Wiles et al. (2008). However, this would be a completely individualised discussion since there is little guidance available on how to proceed (Smythe & Murray, 2010). I decided to contact Teresa to begin this discussion, and move forward bearing in mind that the consent form itself is only the start of a reflexive process that should last throughout the whole research period.

7.3 Reflections now(ish) …

Teresa's Tale is so rich, in terms of her individual circumstances and the occurrences during the MEC, that I thought it would not only be possible but also extremely interesting to ditch the full warp/weft design I was developing, which would contrast the stories of several students against the cohort, and instead focus purely on Teresa's Tale.

Since then I have contacted Teresa several times to arrange a meeting. Each time I try to contact her, it takes a while for her to reply. When she replies she always says she is happy to meet, but she does not reply when I try to tie her down to a specific meeting. I therefore believe that Teresa does not want to proceed with any further involvement and I have stopped trying to contact her. I progressed with the warp and weft plan without Teresa.

In this chapter, I have looked again at my ethical stance. As a result, I now believe I have a deeper and more robust understanding of the need for a strong ethical stance and what that looks like.

In the next chapter, I will discuss the other issue that arose from reviewing my research design (chapter 6, pages 73-88), namely my philosophical stance.

Chapter 8: How do we know what we know? The journey from constructivist to enactivist

How do I view the world, and how do we know what we know? Originally I described myself as a constructivist, but now I would say that I am an enactivist. In sections 4.2 (pages 33-34) and 6.1.5 (pages 78-79), I begin to describe why I take an enactivist stance, but at the point when I originally decided this, I did so without the understanding I now have of both constructionism and enactivism. I therefore need to reflect on constructionism and enactivism together.

In this chapter, I will address what constructivism means to me, as well as how and why I moved from constructivism to enactivism. This move did not occur overnight; it was a long slow realisation, which has run alongside everything else I was doing. However, possibly a key to this change is my engagement with literature concerning narrative and theories of cognition, which showed me that "truth" is not fixed (section 5.5.2, pages 66-68) and memory is not fixed and reliable (section 4.1, pages 31-33).

8.1 Constructivism or constructionism?

As stated previously (section 4.3.2, pages 35-36), I believe that we each have our own unique view of the world. I have, so far, used two words, constructionism and constructivism, almost interchangeably, but they are not necessarily the same thing.

"Social" constructivism can be described as making meaning in a social context, i.e. we construct meaning jointly with others (Crotty, 1998). He describes how some people use constructivism to mean constructing knowledge independently of the social world, a view shared by Delanty (1997). However, my view is that there is a continuum between social and individual construction. I suspect that, when an individual constructs meaning they do so both socially and individually. For example, I am reading Crotty at the same time as writing now. I am engaging in a social interaction, albeit remotely, via the book and the ideas of another, at the same time I am thinking on my own about these ideas, which were triggered by reading the book. This is neither purely social, nor purely individual. For simplicity, I will use the word constructivism for the combination of social and individual construction.

8.2 Reflection on epistemology and ontology

Looking back now as I am writing up this thesis, I can see that my struggle with the issues of ontology and epistemology is clearly linked with my reluctance be put in a box before I fully understood what the label on the box signified. Moreover, I can see why this was causing me such a headache.

Crotty (1998) thinks that the term "theoretical perspective" is better than talking about "ontology". He sees ontology as the philosophical idea of "being", which is often not addressed fully by researchers, who, according to Blaikie (2008), tend to talk about how they view the world, i.e. their theoretical perspective. I find this useful as it removes some of the mystery around exactly what it is I am trying to define. I can describe how I view the world i.e. my theoretical perspective! I will therefore use the term theoretical perspective from now on.

I was also assuming that I needed to start with knowing what my ontology is, with epistemology and methodology following on in a logical, top-down fashion. By contrast, Crotty (1998) describes a bottom-up approach, starting with methods, which may be qualitative or qualitative.

Crotty (1998) also points out that, in fact, qualitative or quantitative methods are not positivist or non-positivist. Indeed, both qualitative and quantitative methods can be used effectively in both positivist and non-positivist research. Rather, it is how the researcher regards reality that determines whether they behave in a positivist manner or not. Crotty (1998) also points out that constructivism exists in some form in many theoretical perspectives.

Turning to the question of reality: positivists believe that an objective reality exists independently of any conscious minds. Objects have meaning in their own right. Positivists discover the "truth" about the objects they investigate.

Constructivists believe that objects exist but have no intrinsic meaning. Meaning is constructed through a conscious entity's engagement with the object.

Subjectivism sits at the other extreme of the spectrum from objectivism. Here, according to Crotty (1998), meaning is created by the conscious entity and imposed on the object. This differs from constructivism in that there is no interaction between the object and the subject.

Crotty (1998) describes constructivism as bringing together objectivism and subjectivism. This feels sensible to me, as a continuum with objectivism at one end and subjectivism at the other. Constructivism, perhaps, is everything in between with differing shades of both. Maturana and Varela (1992) believe that neither a totally subjective world, to be created, nor totally objective

world, to be discovered, can be correct. They use the idea of a razor's edge to describe the path between the two.

Finally, identifying the distinction between these three epistemological divisions has made it crystal clear that I am constructivist, in that I sit somewhere between the two extremes of objectivism and subjectivism. I now realise that "constructivist" is an insufficient epistemological description on which to base my research design, since essentially all that it entails is being non-positivist.

8.3 From constructivism …

If I think about myself learning mathematics, when I encounter a new concept, I usually start by drawing pictures to help me to understand. Yet, most of my memories are of being taught algebraically. This is fine. I can follow the steps and see that one does, indeed, lead to another. However, it is only with my pictures that I would say I understand. For example, completing the square. The algebra is easy to follow, but the diagram shows why! I was taught by an algebraic approach that led me to see mathematics as hierarchical with one thing building on another. In my experience, it is quite common for people to talk about difficulties with mathematics because some of the building blocks are missing, leading to the idea of a wall with holes in it. A construct!

I did not think much about this until I began to teach. I began to see mathematics as a framework of interconnected ideas that can be put together in different ways, a bit like Zometool, a set of rods and balls that connect to make mathematical models (https://www.zometool.com/). I could see that different people connect things in different orders and via different nodes. So, everyone is building a different shaped structure out of the same rods and nodes.

Put simply, that is how I came to constructivism. The mathematics is "out there" for us to discover or invent, but we each construct our own view of it. There is not one objective reality that we all share. We do not even know, and cannot tell, if other people hold the same view unless something shows us the difference, e.g. where I drew a picture, my teachers wrote algebra.

When I started teaching, I was dismayed to learn that my Post Graduate Certificate of Education (PGCE) did not look at child development in any great detail. I thought it would be useful to know about how early childhood experiences impact on learning later on. I found this to be true. For instance, when I was in my second year of teaching, I taught year 7s and 8s (11- and 12-year olds) who were at levels 1 and 2, and in one case working towards level 1. These are the old National Curriculum levels (Qualification and Curriculum Development Agency [QCDA], 2010), which were in

use until 2014 (DfE, 2014), where level 2 would be the level of an average 7 year old, and level 1 a 5 year old. These children loved mathematics lessons. They engaged wholeheartedly in lessons, and, in my opinion, behaved as mathematicians. They hypothesised, tested their theories and got excited when they found new patterns. But they were operating on mathematical ideas they were expected to have mastered 5 years previously. One day, I taught a probability lesson based on a pack of cards and discovered that lots of them had never played cards. They had trouble sharing resources and squabbled a lot. This led me to discover that they had not played games at home, where sharing and taking turns are important. I also discovered that many had not done dot-to-dots, or colour-by-numbers or even jigsaws as small children. At that time, my own children were about 3 years old and did all of those things regularly.

My classes did not know the rules of turn taking. They had not learnt to recognise numbers through regular contact with them in play situations. They lacked so many experiences that until then I had taken for granted as part of growing up.

Because of this interest, I began the master's degree by taking a course on the psychology of learning because I thought it might help address my wish to understand how children access learning. It did not do that, however. What it did was to give me a model of the brain as a computer with inputs and outputs, and some understanding of how restricted our ability to process inputs really is. This only increased my interest and wish to know more about how we do indeed engage with the world.

Over the next few years, I read about teaching and learning, more often than not picking papers from psychology and cognition backgrounds. Hence, by the time I completed the master's degree, I knew enough to believe I was a constructivist. It was the best fit I had at that point in time, i.e. I was making sense (section 8.4.4, pages 104-107) of the world that was available to me.

In the past, I imagined that we construct a model of the world from our own perspective, based on our interaction with others and with the world. Davis et al. (2000) give a slightly different take on this. Rather than constructing a model of the world, they describe cognition, defined by Oxford Dictionaries as, "The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses" (https://en.oxforddictionaries.com/definition/cognition), within the constructivist paradigm as allowing the best fit for the individual to the situations they find themselves in. In other words, our individual constructions of the world must therefore be fluid rather than fixed. This view matches with my previous findings, when I investigated if my students have the same understanding as me. When comparing how they linked trigonometric concepts together, before and after being taught a unit on trigonometry, I was surprised to discover that

rather than connecting new knowledge into an existing model, they appeared to construct a new model (Stansfield, 2009; pp. 62-67).

I had begun to read some work by enactivists but, at that point, did not recognise what that meant, other than the sense of "I change my environment and the environment changes me", which simply felt like common sense.

I continued reading recreational psychology books such as those by Richard Wiseman (2007) and Malcolm Gladwell (2006), which led me into other slightly more academic books such as those by Damasio (2000, 2006).

Starting this thesis, I still thought I was constructivist but I was reading widely and over time I came to realise that the computer model of the brain and any associated constructions held in such a brain could not be right. Kahneman's (2012) idea of fast and slow thinking struck a chord as I know I make decisions really fast without stopping to consider whether it is the right or wrong choice. It made sense by giving a theoretical perspective to the stories told by Wiseman (2007) and Gladwell (2006) about situations where an instant decision is often a better decision than that made when all the pros and cons have been considered and the "best" option chosen. It appeared that some thinking did not even bother with the brain, bypassing it altogether.

8.4 … towards enactivism

Returning to Maturana and Varela (1992), they believe that we respond to the world through our actions, both biologically and socially. Constructivism clearly acknowledges the social aspect, but what of the biological?

Maturana and Varela (1992) propose that we interact with the world on a bodily level. For example, having learnt to type I no longer have to look for the letters on the keyboard. I think the sentence and my fingers automatically find the letters, although I needed to look when I was learning. Interestingly, I found I was looking when I typed this sentence because I had become consciously aware that I was typing. It is as if my brain did not even know I was typing until I told it I was doing just that! Kahneman (2012) describes just this sort of automatic response as fast thinking. Slow thinking by comparison is where we are conscious of making a decision. He also neatly links together the action of the brain and body working together, as shown in his example of someone walking who is asked to do a long multiplication. Kahneman (2012) says they will almost certainly stop walking in order to do the calculation, but will be unaware that they have done so.

I previously defined understanding as the connections an individual makes in various ways, one being between concepts and experiences. However, I came to the conclusion that since the connections are inaccessible to me, and possibly also to the individuals themselves, I could only infer their understanding by watching their actions (Stansfield, 2009). It seems that I was indirectly defining understanding in terms of actions, yet the idea behind connections is of some sort of mental map. Whether I like it or not bodily actions and mental understanding are linked.

Perhaps the answer to my previous question, "How do I know if students understand the same thing as me?", might simply be that I observe them engaging with the world in the same way as me. Not only is observation (section 8.5, page 108) the only way I can access their thinking, being unable to see into their minds, but their actions *are* their thinking.

However, in order to try and understand the link between actions and cognition, I considered four models of cognition in an assignment (Stansfield, 2013b). This process allowed me to step away from a model where cognition is firmly entrenched in the individual brain, by considering how we engage with our environment. This assignment (Stansfield, 2013b) is both summarised and expanded on below, beginning with Ancient Egyptians and Oxford dons.

Ancient Egyptians considered the physical brain unimportant. The body was the essential "you" and was preserved perfectly without the brain. By contrast, some 21st century Oxford dons (Saul, 2013) paid a fortune to have their heads preserved cryogenically after death in the belief, eventually, technology will allow them to be brought back to life.

8.4.1 "Classical" model

The dons' thinking is in-line with the "classical" model of cognition, which holds that cognition resides in the brain (Fuchs, 2009; Goldman & de Vignemont, 2009). Their view can be explained using the metaphor of the brain as a computer processing many parallel inputs, with our senses, such as sight and sound, being equivalent to the keyboard, microphone and so on used to input information to computers. Having processed the inputs, and decided on action, the brain informs the output devices, such as the hands and feet, what to do in the same way that a computer issues instructions to a printer (Ashcraft, 2006).

8.4.2 Embodied cognition

However, as Goldman and de Vignemont (2009) point out, the brain is embedded in a body and that body affects how the "inputs" are perceived and acted on. They use bats versus humans as an example. Humans use eyes to locate themselves in their environment whilst bats use an echolocation system. Whilst we could argue that eyes and echoes are simply different input devices, the way the individual bat or human perceives the world will be very different from each other, both being dependent not only on their brain but also on the body they are equipped with, an idea known as embodied cognition.

Embodied cognition allows that the individual responds bodily and competently to their environment, i.e. brain and body acting together (Thompson, 2012; Ziemke, 2003). The term "muscle memory" is often used to describe a person being able to perform a physical action quickly and accurately without having to stop and think first. In the same way, I have heard people talk about "maths muscle", i.e. having learnt and practised some aspect of mathematics, the individual can now perform it quickly and accurately, in some way bypassing the brain.

Damasio's (2006) theory of somatic markers explains how a quick bodily response to danger is necessary for survival. An example could be the shadow of an eagle flying over a nest of fledgings causing them to bodily cower and hide, faster than their brains could process the image. They have the shadow image flagged or marked in some way to ensure a quick response.

8.4.3 Extended mind

Thus far embodied cognition can be seen as brain and body working together to respond to the surrounding environment, which is outside the body. In putting forward a third theory, that of extended mind, Clark and Chalmers (1998) consider the nature of the boundary between the individual mind and the environment.

Clark and Chalmers (1998) tell the story of Otto and Inga visiting an art gallery. Inga goes directly there, having recalled the route from memory. Otto, who has Alzheimer's and therefore cannot remember well, refers to his notebook to find the address and is then able to go. Otto uses his notebook in the same way that Inga used her memory, thus it can be considered part of his cognitive system (p. 12-14). Merleau-Ponty (1962), who was perhaps the first to suggest the idea of the extended mind, gives examples such as a feathered hat, a

car, a typewriter, a blind man's cane and an organ. In each case, the user interacts with the world by using the item. Brey (2000) describes them all as extending tactile perception of the world. Brey (2000) also includes many technological aids such as glasses and hearing aids as embodiment. He describes them as "withdrawing" from perception, since they are not perceived by the individual in their own right, rather they are used to experience the world working with the eye or the ear. Brey (2000) states that there are two categories of embodiment involved, one set of items allows, or perhaps forces, motor skills to be performed, e.g. skilful driving to get the car through a narrow space, the other enhances perceptual skills, e.g. distinguishing individual sounds, or colours. Although, linking back to Merleau-Ponty (1962), both can occur concurrently. His example of a blind man and his cane illustrates this. Using the cane requires motor skills which will be automatic for a skilled user, whilst his perception of the world is at the tip of the cane.

Moving from the classical model, to embodiment and onto the extended mind theory, the boundary between the individual's mind and their environment moves outwards from the brain, to brain and body, to brain, body and tool or utensil. How far the mind extends depends on the tool used; my glasses allow me to see my immediate environment, whilst a telescope will allow me to see into outer space. All three models assume an interface between the individual and their environment.

But what if there is no boundary? Imagine the extended mind extending to infinity. If this were the case, the mind and the environment would become one.

8.4.4 Enactivism

I describe enactivism, below, by considering some of its key features, beginning with the idea of the individual and the environment as one.

Structural coupling

Rather than describe the cognitive entity as being "inside" the environment, Torrance (2005) sees cognition as the coupling of the organism with its environment. Maheux and Roth (2011), also, consider that the organism and its environment are bound together by the interaction between them. For them, it is the relationship between the individual and the environment that is important. Vörös, Froese and Riegler (2016) describe how, in

enactivism, there is no dualism of view. As Maturana and Varela say, “There is no inside or outside, but only maintenance of correlations that continually change” (1992, p. 169). Vörös et al. (2016) say the world and the individual co-determine each other, whilst remaining distinct from each other. This co-determination is known as structural coupling.

McGann, De Jaegher and Di Paola (2013) discuss how the coupling between the individual and their environment appears to be more important that the structure of either. They describe the coupling or interaction, of the individual with its environment, as meaningful, in that the individual is adapting to the environment, and vice-versa. For example, a horse and rider form a structural coupling for the length of time that the rider rides the horse. Both act together as one, responding in the moment to the other’s actions. Moreover, McGann, et al. (2013) say that since we are born into a social world we are embedded in that world just as much as we are in the physical world.

Emergent

Referring to the work of others, McGann et al. (2013) describe the interaction between the individual and the environment as “emergent”, by which they mean that neither the individual nor the environment is in control of what happens. Rather, a change in one instigates a change in the other. Both are responding to the emergent situation. They give the example of a group of people reading a text out loud together. There is no leader, yet the text gets read with individuals continually adapting their speed and tone to fit with the rest of the group.

Sense-making

McGann et al. (2013) use the idea of the individual “coping” with their environment and also “sense-making” through their interactions with their environment in, what appears to me to be, an interchangeable manner. I see the term sense-making as a way of encapsulating the co-determining interaction between the individual and the environment.

Thompson and Stapleton (2008) describe cognition as the interaction of the organism with its environment, pointing out that even bacteria, which have no brain, can sense and move towards sugar. Thus, cognition is seen as a sense-making interaction between the organism and its environment.

Knowing

The ideas of Thompson and Stapleton (2008) are based on the work of Maturana and Varela (1992) who proposed that living organisms are "characterised by their autopoietic organisation" (ibid, page 47). Autopoiesis means that the organism is an autonomous being that can reproduce and maintain itself within its environment. Damasio (2000) says that an organism's awareness of its surrounding is necessary for "knowing". He describes different levels of interaction between the world and organisms, which depend on the structure of the organism.

At the lowest level are simple metabolic responses to the environment. These are automatic life preserving responses of which the organism, whether it has consciousness or not, is unaware. The next level consists of automatic movement or reflexes, such as cowering from a shadow. These responses are automatic, pre-programmed into the individual, and occur without conscious thought. The third level is, according to Damasio (2000), "feeling". He describes how, for a conscious being, knowing is the result of feeling. Indeed, he goes further and says "consciousness is knowledge, and knowledge is consciousness" (ibid, p. 26), thereby linking knowing and feeling through consciousness. An idea which Thompson and Stapleton (2008) summarise when they say that the autonomous organism's activity generates its "cognitive domain" through its interactions with its environment.

Maheux and Roth (2011) offer a reminder that knowing occurs through coupling with the environment when they describe "knowing-with" or "being- with". They say there is an essential "with" to any action. In other words, all actions are undertaken coupled with the environment. Although most literature does not explicitly state the "with", the implicit nature of "with" is an essential part of enactivism and should not be forgotten.

Embodiment

Cosmelli and Thompson (2010) explored the implications of the brain through their "brain in a vat" thought experiment. They imagined the brain being disconnected from the body, concluding that the brain on its own could not make sense of the world. Drawing on the work of Cosmelli and Thompson (2010), McGann et al. (2013) point out that enactivism *is* an embodied view of cognition. Moreover, Reid (2011) goes further and describes cognition as a bodily function.

Thus, I believe, cognition, or consciousness, is the boundary between the organism and its environment including the social context (McGann et al., 2013). Knowing is a direct result of interacting with the environment, and "knowledge" is uniquely individual since it is formed by that individual through their experience of their world (Damasio, 2000).

Learning

McGann et al. (2013) describe how new learning changes what we already know, which fits well with my own previous understanding (section 4.1, pages 31-33). They describe how each new situation we encounter results in us modifying previous patterns of behaviour as we adapt to new situations.

I am particularly interested in McGann et al.'s (2013) point about how a novice's coupling with the environment is different to that of an expert, through the example of a novice versus an expert guitar player. The novice needs to think about each note, whilst the expert plays the guitar without thought and appears at one with their instrument.

Expert knowledge is explored in detail by Gladwell (2006). As an example, Gladwell (2006) tells the story of a statue that a museum bought, prior to which the museum had instigated a thorough investigation of the piece trying to ensure it was genuine before buying. Yet, when it went on display several experts, who had not seen it before, felt an immediate, yet inexplicable, revulsion to it. They had a bodily reaction, which they could not explain, yet they all knew that the statue was a fake. Further detailed investigation into the statue's provenance showed that it was indeed a fake.

For me, enactivism feels like a comfortable place to be. It allows for individual responses to the same input to be very varied, since each individual's past experience may be very different. Now, asking, "how do my students know the same as me?" becomes an invalid question. Their way of knowing *will* be different to mine. Moreover, I cannot expect to see students behaving in exactly the same way as myself, but I could, perhaps, expect similarities? Having realised this, I also realised that I had found my theoretical perspective on "knowing".

8.5 Enactivism: as theoretical perspective and epistemology

I have explored some key aspects of enactivism above (section 8.4.4, pages 104-107). Now I consider why enactivism is my theoretical perspective and epistemology.

David Bowie (n. d.) is reported to have said, “Once I've written something it does tend to run away from me. I don't seem to have any part of it - it's no longer my piece of writing.” In other words, it has become part of the environment. According to Proulx and Simmt (2013), knowledge is not an object or a possession. They question if we should drop the word knowledge, with its implication of ownership of some concrete thing, and consider instead knowing, because knowing is about doing, knowing is action, and knowing is a way of being. This idea fits with my previous experience, in that I discovered that I cannot know what someone else knows. I can only observe what they are doing. In other words I have been treating their actions as their knowledge. Their doing demonstrates to me their knowing. As Maturana and Varela (1992) state, “all doing is knowing, and all knowing is doing” (p. 26).

Equally what we know of the world affects how we engage with the world, i.e. what we do. Each (knowing and doing) affects the other implicitly in a sort of endless loop. We learn, i.e. come to know, through doing. We do through what we know i.e. what we have learnt. Proulx and Simmt (2013) describe this as a fusion of ontology and epistemology.

Thus, it is clear to me that not only does enactivism give a philosophical perspective on the world. It is also clear that learning, or knowing, happens through the coupling of the individual and their environment. In other words enactivism *is* also an epistemology.

8.6 Enactivism: as methodology

Enactivism is a methodology as well as being a theoretical perspective (Reid, 1996; Reid & Mgombelo, 2015). Reid and Mgombelo’s (2015) reason for this is based around the role of the “observer” and their relationship with the world around them. As Proulx and Simmt (2013) have pointed out, knowledge is not a tangible thing. Rather, it is the interaction with the environment. Knowledge or more exactly knowing, is created in the moment of doing. The interaction can be observed – by someone else or by one’s self. Proulx and Simmt (2013) say that we solve problems that are brought forth by our interaction with the environment in the best way that we can. They use the word *trigger* and explain how the same thing will trigger different reactions in different people.

Maheux and Proulx (2015) think that when observing knowing occurring there is no need to be aware of prior situations. It is sufficient to see this one. If someone says that they know mathematics or that they are a mathematician then we would expect to be able to see them doing mathematics. From there, we can postulate what might happen in the future. Maheux and Proulx (2015) point out that when undertaking enactivist research one should focus on the doing in that moment and avoid assumptions about what might have been before. The same point is made by Reid and Mgombelo (2015), who discuss how, because we use our own cognition to describe our cognition, we are not able to describe effectively how we perceive the world, but we are able to perceive how we react to the world.

According to Maturana (1970, p. 2) "everything said is said by an observer", thus researchers are observers (as are all participants). Indeed, according to Lozano (2015), the connection between the researcher and the participant is at the crux of the research process. The connection and interaction between the researcher and the participants changes as a result of their interaction. Thus the researcher does not encounter a fixed world, but a world in constant flux, and their research questions evolve as a result.

Lozano (2015) describes the research process as not only non-linear, but a sort of circular recurring cycle of asking questions, reflecting and asking questions again. This fits well with my own experience, as I have described in this thesis, I am in a perpetual battle to try and keep a linear timeline running through a set of ideas that interact and change across time rather than sequentially.

Lozano (2015) describes the need for the enactivist researcher to have an awareness of their own preconceptions, about how their view the world and how their ideas are changing throughout the process. The enactivist researcher is not trying to write a theory of the subject they are researching, rather they are trying to explain what they observe in a way that will be useful to others. Moreover, Simmt and Kieren (2015) say that any knowing is incomplete. In using an enactivist methodology we accept this and leave room for others to share our space.

Coles (2015) says that it is not possible to see data as it really is. Indeed, according to Reid (1996) there is no such thing as data. In Reid's (1996) opinion, "there is no data, only interpretations and interpretations of interpretations." (p. 4). Reid (1996) goes on to say that he uses the words data and interpretation of data interchangeably, which seems sensible to me. Coles (2015) distinguishes between looking at data to find something specific, or avoiding this and having an open mind. He talks about what he calls "unmotivated looking". This gives me the sense of looking at data uncritically to see what emerges without preconceptions.

For Reid and Mgombelo (2015) multiple perspectives are important. They offer the interesting idea that rather than use techniques such as triangulation to confirm a point of view, in enactivist research, one would actively search for different interpretations of the data that may be contradictory. This could be achieved through different researchers giving their differing interpretations. Equally, a single researcher working alone could use different lenses to interpret the data, perhaps through using different frames or theories.

Simmt and Kieren (2015) see enactivist research on three 110s. Firstly there is the observer. This, they say, is the level that most literature focuses on. Second is the idea of the relationship between the knower and the world. Summarised as “knowing is doing is living is being” (p. 311). In other words, it is the interaction with the world that creates meaning. Their third level is ethics and ethical implications of working in an enactivist realm

8.7 Conclusion

To summarise: Enactivism is a methodology as well as a theoretical frame. Enactivist research is questioning and offering possibilities rather than definite outcomes. The researcher needs to be open to multiple perspectives on the world. Enactivist research is also iterative and flexible, the researcher changes through their interaction with the world and therefore the research question can change as the iterative process refines or reveals new perspectives on the world.

Chapter 9: Everything must change

In chapters 1 to 8, I have described my journey from the outset as I moved towards a research design. I had reached a point where I thought I could put together a coherent research design that would enable me to continue with the main work of this thesis.

In this chapter, I describe why this did not prove to be so straightforward and give some deliberations over how to proceed from that point. I introduce a problem brought about by changing jobs and its effect on the way forward.

9.1 Looking back

Having got to the stage where I would be able to put together a sufficiently robust research design, I continued to collect data from the next cohort. My intention was to analyse the data in the warp (cohort) and weft (individual) directions, both of which I had piloted (sections 4.3 & 4.4, pages 35-45; 5.4, pages 54-65). I would then weave them together, which I was excited about as I had not piloted this stage. I was imagining a sort of empty grid of intersections waiting to be filled (section 5.6.1, pages 68-69). But this was not to be. The first problem was that this cohort was very small compared to previous years. It would have been fine if everyone had signed up to the research. However, only two signed up. This essentially meant that I would not be able to undertake the warp (cohort) analysis with this particular cohort. But could I still find a way to proceed with the full warp and weft design?

Obviously, I would be able to analyse the two as individual narratives in their own right in the weft direction. To get a full warp and weft I could either use a previous cohort or wait until the following intake of students and hope I got a larger cohort and more would engage with the research. This was a huge dilemma because there was no guarantee that I would get a larger number of participants the following year. I could not simply wait and hope. I needed to do something to move forward even if I was expecting more participants the next year.

Using a previous cohort appeared far from ideal. The ethical issues I had considered as a result of Teresa's Tale meant that I would have to discuss ethics in more detail in individual interviews than I had previously, but I would need to do this anyway for future interviews. The problem, as I saw it at the time, was that the further back in time the cohort was, the more difficult it would be to pick up from where I had left off. Not least because if I wanted to interview participants I would need to locate them and the contact details I had were not necessarily up to date. Also, I had already used

some cohorts for piloting the warp and some for piloting the weft. I felt that I needed to start with a new set of data about which I had no preconceptions. Moreover, in order for the warp/weft design to work as intended it would ideally operate within the same cohort for consistency.

I had not resolved this issue when a second bigger problem arose.

9.2 Change of context: A dilemma and its resolution

I left my job as MEC course leader, which impacted on my ability to continue with this research project as planned.

One of the outcomes of changing jobs was that I no longer had a role with responsibility for design of the assessment system. I realised that I no longer had any motivation to continue what I had started. The original project was designed to give insight into my students' perceptions of assessment within the specific environment of my MEC course and to feed into the design of the assessment system for that MEC. Several times I was close to deciding to cut my losses by pulling out of this PhD altogether; but there was also a pressure to continue because several people who worked on similar courses had enquired at various times about my progress and were interested in the outcome. However, with no access to further data and only two participants from the last cohort I would not be able to achieve my original ambitions.

For some time I was not sure that I could continue because, with my original plan derailed, I did not know what I could do instead. The sticking point was how could I use the data I had gathered in a meaningful way that interests me and is meaningful to others? It felt like a dead-end with no way forward.

Realising that I needed to go back to first principles, I was able to re-engage with the project. Way back before my master's degree, I had been interested in how different stakeholders view any given assessment process. I wanted to investigate the idea that GCSEs are used for multiple purposes. What are the views of different stakeholders? Why do they hold these views? How has this affected the meaning of the grades that pupils attain? This was too big a study to do for my master's dissertation and so was shelved. However, I am reminded of this when the idea of considering different stakeholders resurfaced on a smaller scale, i.e. within the MEC, whilst planning this thesis (section 2.3.1, pages 15-16; section 4.2, pages 33-34). Yet again this would be too big a project unless it were limited in some way, hence I had focussed on just my students.

I had one of those moments when ideas link without being consciously aware of linking them. It struck me that, when working with PGCE students, there is a tipping point when students become aware of the children and their focus shifts to what the children need to do rather than what they (the student teacher) need to do. Speaking about novice teachers, John Mason (1998) says, "They are caught up in issues of control of themselves and control of others" (p. 247), going on to say "it is of assistance to teachers to work on their sensitivities, to extend their awareness of what students might be attending to by being explicitly aware of what they are attending to" (p. 249), and "Once a shift of attention has taken place, it can be very difficult to recall what it was like not to see things that way" (p. 253). It is this explicit awareness I am referring to, once the student teacher has awareness of the needs of the children, they cannot return to state where they do not have it.

I realised that there had been a similar shift in my own thinking about assessment when I recognised that I could make effective formative use of the regular tests and examinations sat by my classes. Rather than just looking at their scores or deciding who to move up/down a set, I used them to inform my teaching. I was not doing this when I started teaching, but I definitely was by the time I began working on this thesis. I could not say when this shift of awareness began to occur. I do know that I had this awareness after implementing a program of testing pre-and post-teaching a topic. (section 1.1, pages 5-7). Reflecting now has raised several questions for me. When and how did the shift in my perceptions happen? Can I identify this? Does a similar shift happen for other teachers? What is the same and different about what triggers the shift for different people? If I could identify some sort of pattern, would I be able to help people accelerate their move towards it happening?

I can reflect on my own experience to try and identify how this occurred. What if I were to write the story of my own experiences of assessment moving from school to now as an experienced teacher? I could then analyse my own experience; an idea I initially touched on in section 5.4.4 (pages 60-61).

By the time I was writing this section, the two participants from the last cohort had only just finished their PGCEs and had become teachers. Had they made a significant shift in how they view and use assessment during the PGCE? If I could interview these two participants almost immediately, I could compare their narratives with themselves a year earlier at the end of the MEC. I could also compare their narratives with my own at that stage of my career. Thus I would obtain an individual time-based comparison and a multiple person career stage comparison. After all, I have data from the MEC for my two participants and it would be a shame not to make use of it. Although what I have done so far was not with this question in mind, I had permission to contact them for interviews in the future.

Hence, I returned to think about people from other cohorts, some of whom had been teaching for quite a few years by then. I was thinking that I could contact several people, all of whom had started their path into teaching on the MEC but were now at different stages of their teaching careers. If some agreed to take part, I could look at their stories as they moved from pre-PGCE to PGCE, to new teacher, to more experienced teacher, and track how their perceptions of assessment changed as they moved between different stages of their career. With this idea, I could possibly still work with the warp and weft idea, but rather than start with a whole cohort in the warp direction, I would start with various individuals in the weft direction, but then use career stages as the warp direction.

One consideration was, would I be able to track them down? Also, assuming I could, would they still want to be involved? Twice Teresa has agreed to further interviews but has not replied when I try to set a date. I wondered if I could track down Lila, for an update on Lila's Log, and what about Geraldine who got me started?

9.3 Moving forward

I emailed the two most recent participants to ask if they were willing to be interviewed. I also started to write my own narrative, collating names and contact details of people from previous cohorts who had agreed to be contacted. There were ten from cohort 1; eight from cohort 2; seven from cohort 3 and two most recent ones from cohort 4, making a maximum of another twenty-five people I could contact. In fact, this was actually twenty-four, as one of them was Teresa whom I had already given up trying to contact. As I had suspended studies and was working in a new job, this thesis was very much in the background. Hence, I did not start to contact these people immediately. I did, however, know through other sources that some of the email addresses I had were no longer current, and one person was ill. It was, therefore, inappropriate to attempt to make contact, reducing the number available to nineteen.

Before I had begun to make contact with previous cohort members, one of the most recent two, Leone, replied declining further involvement. The other, Keziah, replied initially saying that she was willing to be interviewed. As with Teresa, despite repeated attempts, I did not manage to get a response from her to set a date even though her original response was positive.

At this stage, I took stock of the amount of time I had left to complete this thesis; the length of time it was taking me to get any response from the people I had contacted; and how little success I had had so far in obtaining any further interviews. I reluctantly came to the conclusion that it was likely that too much time would elapse waiting for replies and trying to arrange interviews if I were to try

and contact the nineteen possibilities. I felt it was likely that I would run the clock down with little to show for it, ending up with little time left to work with whatever data I did manage to generate. Once again I took a pragmatic approach, deciding it was more important to move forward with what I had rather than to wait and hope. This meant abandoning my new warp direction based on career stages, and that I would be working with the data already gathered for Leone and Keziah. I also set aside the work I had done on my narrative. Not only was it incomplete, but it was no longer necessary for crossing career stages. Hence it is not included in this thesis.

Before going any further, I reassessed my research design in the light of these decisions, to see if it was still fit for purpose (sections 6.1.1 to 6.1.9, pages 76-87).

For clarity I will address each section below.

Working title (section 6.1.1, page 76)

There is no reason to change the working title at this point. I will decide on the final title at the end, in the meanwhile it remains as:

> An investigation into students' perceptions of assessment on one Mathematics Enhancement Course.

Context (section 6.1.2 page 76) remains unchanged.

Aims and rationale (section 6.1.3, page 77) remain unchanged.

Research question (section 6.1.4, pages 77-78)

Had I been able to obtain more data over time from my participants my research question would have changed to:

> How do perceptions of assessment change as an individual moves through the different stages of their teaching career?
>
> Is there any commonality in how perceptions change that could be incorporated into teacher training courses?

However, this was not to be and my question remains unchanged as:

> How do students' perceptions of assessment change over the course?

Theoretical perspective (section 6.1.5, pages 78-79; chapter 8, pages 97-110)

Previously I was not entirely clear about my philosophical background (section 6.1.5, pages 78-79). I thought I was constructivist, but was perhaps enactivist. I, therefore,

explored how and why I moved from constructivism to enactivism, as well as what it means to take an enactivist position (chapter 8, pages 97-110). I now feel secure labelling myself enactivist.

Methodology (section 6.1.6, page 79; section 8.5, page 108).

As a result of exploring my move from constructivism to enactivism, my methodology becomes defined as enactivism since enactivism is a cohesive way of thinking.

Ethics (section 6.1.7, pages 79-80; chapter 7, pages 89-96).

Previously I was aware that my ethical stance was lacking (section 6.1.7, pages 79-80). I, therefore, explored what it means to take an ethical position. I am now happy that my ethical stance is robust (chapter 7, pages 89-96).

Methods (chapter 5, pages 49-72; section 6.1.8.1, pages 81-87)

Since I now have two narratives to analyse, I intend to use narrative analysis as described in chapter 5 (pages 49-72). The work I did (section 6.1.8.1, pages 81-87) on expanding my understanding of thematic analysis, will not be needed. I will lay the two narratives alongside each other to look for patterns of similarities and differences.

Data Analysis (section 6.1.9, page 87)

My intention is to perform narrative analysis on each of the data sources separately, since each may reveal differences in participants' perception.

That each of the descriptions above is so brief is because previous work has covered each aspect in enough depth to proceed.

In the next chapter, I will describe the data, followed by its analysis in the one after that.

Chapter 10: The data

In this chapter, I am presenting the resources that Keziah and Leone gave permission to use and will then write my analysis of them. I am starting with their reflective learning logs as Keziah and Leone started these on the first day and continued writing them throughout the course. (Note: spelling is reported exactly as written in the logs.) In addition to their logs, I also have the transcript of interviews with both Leone and Keziah from the end of the course, as well as tutorial notes and assessment feedback front sheets.

My original plan was to draw on the available data for each of Keziah and Leone and to analyse each of individual's data before comparing them. Initially, I read each log through several times, and then began to write about Keziah and Leone separately. I abandoned this approach because I became aware that I was writing from my perspective and was drawing on those aspects that represented how I already viewed each of them rather than trying to see the world through their words. I feel it may be more appropriate to look at both logs, side by side, which will force me to justify comparisons based on their words rather than drawing on my memories. I have therefore returned to the data itself.

Extracts are included below, however, the full reflective logs, interview transcripts and tutorial records are available in appendices 7 to 12 (pages 212-217). Assessment feedback sheets are not included in the appendix since they are only available as photocopies and need to have names and dates removed manually.

Note: all names have been replaced with pseudonyms and all dates have been replaced by week numbers in order to avoid identifying the cohort by the year.

10.1 Keziah and Leone

Keziah was one of the younger members of the cohort. She had worked for a year since graduating as a way of building up experience in order to apply for teaching. She had a background in PE and was a keen athlete herself.

Leone was also one of the younger members of the cohort. She had a degree in PE and had worked for 4 years with adults, and then children, with autism prior to joining the MEC.

10.2 Reflective logs

I have included selected extracts from both reflective logs below. In each case, I have included the same whole week from both Keziah and Leone. I have selected week 1 as it is where they give their initial response to the course. Week 15 was my first thought for the next extract as it is the beginning of the second half of the 28-week course, however, something occurred at the start of the following week that was a critical event for me, hence I am including week 16 instead. Week 23 is included as this is, therefore, the last log that was submitted by both and is therefore as close to the end of the course as possible.

10.2.1 Week 1

10.2.1.1 Keziah

Reflective Learning Log Week 1
Monday **Induction:** Today was an admin/ induction day; I met fellow students and tutors on the course, they ran through lots of important information. The day gave me a lot of different emotions, I felt excited to start as I really want to get back into maths, and I feel nervous as to whether my previous ability will come back. By the end of the course my aim is to be able to teach up to A-Level, a lot of hard work is going to be needed. There is a very small group of us completing the MEC course this year; I imagine we will get to know each other very well. In the afternoon we went onto some maths to get our brains working, at first I felt I was out of my depth, after we got our brains going the maths started coming back and it was good fun. My group got very excited when we finally got the right answer. The day rounded up by looking at posters the previous MEC students had made for us; there were lots of important points made and some useful advice. I went and brought myself some squared paper! Going to be eat, sleeping and dreaming maths from now on!
Tuesday **Mathematical Thinking 1:** The 'crossing the desert problem' from yesterday started us off today, after thinking about the problem over the evening I was convinced there was no other way and the furthest they could go was 9 days. Dennis had come up with the solution that they could go for 10 days, which they proved to us. It was really good to see their way of thinking. I had tried to work out a completely new algorithm for 3 people where as he had used the same algorithm and added on the extra man, it made so much more sense but was not something that came into my mind. We covered a lot of different problems over the day which I found hard and very mentally demanding, the problems showed us so much more than just simple problems, we covered lots of things such as prime number, triangle numbers, magic squares, these are all things I have heard of, however I cannot remember much about them. I need to go away and brush up on a lot of these simple concepts.
Wednesday **Mathematical Thinking 1:** Today I found I was looking problems with a more logical approach and different number patterns are starting to mean more to me. I enjoyed the break out problem, I approached it logically and clearly, it allowed me to clearly see where the patterns were, and to solve it affectively. The people maths problem of 'who buys the beer' felt slightly painful at times, we could all see patterns going on but verbalising and expressing them was difficult. There were lots of periods of science where I think we were hoping Jayda would come in and help us, however she left us to it and finally together we found a solution. This way of teaching is not something I am used to, however I have found it very effective, as we had to test our brain and really think about what we were doing to come up with a solution, and when we found the solution the method and what we did was a lot more memorable. Over the day a lot more problems were solved and by the end of the day my brain hurt a lot.
Thursday **Mathematical Thinking 1:** As homework we were set the 'disc problem', I found going over this quite frustrating as the correct answer of finding that a + b + C = 17.25 which could not be true is something I had done, however I had crossed it all out because I assumed that the problem could be done, so what I was doing much have been wrong, this shows I should always think about my work more and not always assume things. Me and Tom then worked together on the next disc problem, I found we worked well together, our ideas would bounce off each other and push each other on and when we found a solution we had a bit of a crazy 'high 5' moment. Working together with all members of this class has been really good, it has showed me how different people approach problems and that there are many solutions to a problem. Something that I need to work on is putting what I mean into words that can describe it clearly to others.
Friday **Algebra 1:** I felt a little nervous before the first day of algebra as I looked through the GCSE textbook the night before and saw that algebra contains a huge amount of different work. At the end of the day I felt really pleased, throughout the day I grasped all the concepts given and remembered how algebra worked and how rewarding it is. Jen was really good; she explained everything clearly and made us feel comfortable about asking questions no matter how silly they might be. The main errors I made was with missing out minus signs, which as I know can make your work very wrong. This is something I used to do back at school and I must make sure I pay a high attention to detail. Alison told me a good technique that she used to help her make sure she never got her minus' wrong, it is to put circles around each part of the equation so that you know where the minus belongs. Working in groups is really helping me as it's giving me a lot of help and ideas that I probably wouldn't come up with on my own.

Table 3: Keziah's reflective log – week 1.

10.2.1.2 Leone

Reflective Learning Log: Week 1
Monday **Introduction & Mathematical Thinking (MT1):** It was great to meet everyone today and find out a little bit more about them. It seems like a nice group and I hope that we will all be able to support each other to learn. I am worried as I'm the only person in the group who hasn't done A-Level before- I'm so worried about being left behind! We did some group work on maths problems this afternoon. It was good to be able to see the different ways that people solve a problem and listen to their explanations. I didn't contribute as much as I would have liked as I was lacking in confidence a little. **What do I want to be different about me at the end of the course?** I want to be much more confident in my abilities. **What will be the stumbling blocks?** Getting overwhelmed, especially during C3/C4 content. Getting back on track and not becoming stressed if I feel that I am falling behind others. **Targets/ To Do:** • Make sure to contribute fully during group work. • Discuss taking AS-level with JS, as suggested in the course handbook.
Tuesday **Mathematical Thinking (MT1):** We did numerous activities today using properties of number. I found the work we did on prime numbers really interesting as I have previously not really known what use they are, just knew that they existed! I found that I got lost at times but if I concentrated on how others were explaining their ideas I could mostly pick up and understand the concepts. I find 'out of the box' thinking quite difficult as I was taught by rote whilst at school, but understand why it is important to practice. Whilst I found the activities fairly mind-bending, on reflection I can see how useful it is to have this knowledge at your fingertips and how key it is for teaching. **Targets/ To Do:** • Enquire at local schools regarding AS-Level entry. • Devise an efficient filing system to keep work organised.
Wednesday **Mathematical Thinking (MT1):** Although I still find this topic difficult, I found that today I had much more of an idea about where I might start. I also had more confidence to go with something and see what happens with that train of thought. I particularly enjoyed the 'Who buys the beers?' problem as it covered a lot of aspects of number. I enjoyed working out that it was all based on powers of 2, and liked the fact that we came to a clear conclusion and proof of our conjecture.
Thursday **Mathematical Thinking (MT1):** It was good to work on a problem on our own last night as it forced me to come up with my own train of thought. I was pleased this morning to know that others had used similar techniques, and this gave me confidence in my abilities. It was great to be able to follow the relatively simple proof of why the problem couldn't be solved after Alison's 'light bulb' moment! I found the work we did involving Pascal's triangle particularly interesting today, as I didn't realise in how many things it can be involved. I'm starting to see how properties of number are everywhere and I'm finding it fascinating! **Targets/ To Do:** • Research Pascal's Triangle to better understand how it is used, and understand it's patterns and properties.
Friday **Algebraic Manipulation (AL1):** Today we took algebra right back to the start, which was great for me as it's an area I can find difficult. It was interesting to equate words, flow charts and formulae to each other and work between them, as this isn't something I've done before. I am glad to have found out that I am weak in the areas of writing equations from information given and in changing the subject of an equation. These area weaknesses that I have found hinder me when studying maths to a higher level and it's good to get the chance to work on it now at the start of the course. **Targets/ To Do:** • Complete exercise 1B on writing equations in C1/C2 book • Complete exercise 1C on changing the subject of an equation in C1/C2 book.

NB: If a target/to do point is in red, it has not been completed yet.

Table 4: Leone's reflective log – week 1.

10.2.2 Week 16

10.2.2.1 Keziah

Reflective learning log Week 16
Monday:Bank Holiday
Tuesday **Geometry and trig:** The day started very tense. We were moved into the computer room upstairs and then we received our core 1 feedback. I felt that the feedback was abit hard as I had worked really hard for the exam and got a really good result yet my feedback still wasn't great. The comment about arithmetic slightly annoyed me as I feel I have been working really hard over the duration of the course to get really good with numbers, manipulating them and recognising things straight off, I felt this paid off as I did this very well in the exam and didn't make silly errors however my feedback brought up that I needed to improve on this (I agree with continual improvement however I felt I had done well with the exam). Leone especially got very upset and everything got abit heated. I think she felt that sometimes our hard work isn't noticed and that her especially is trying really hard. I also think she is under a lot of pressure with her exams. Looking back on the morning I think that maybe it is a good thing that it happened as it will have released some feeling and then it can all be moved past. I think that it will and that hopefully the group will get more posititve. The trig that we did went okay. Some abit confusing but I think I understand it. I will go back and do some practice.
Thursday **Geometry and trig:** Today we took the core 2 paper. The paper was pretty hard and I found some of the questions were hard to understand. I think that is just the MEI exam board. I was pleased that I got over the reqired 80%. I found the AP and GP question particularly hard even though I felt like I had revised them well. In the afternoon I felt it hard to concentrate in geometry and trig but I think that's because I had used all my brain power on the core 2 exam.
Friday **Statts 2/ ICT:** I always find statts abit boring so it felt like a long morning. I enjoyed the ICT as I feel interested in this type of thing and I think it is something that will be used a lot more in schools as time progeresses. I learnt a lot of from the ICT session and I think these sessions are good. I do think after a boring morning of statts we may not have been as engaged as ever. The worksheets that caron gave us were good and will be good to look back at when need in of a reference for the programs she showed us.
Targets - Practise geometry and trig

Table 5: Keziah's reflective log – week 16.

10.2.2.2 Leone

Reflective Learning Log: week 15-18 **NB:** If a target/to do point is in red, it has not been completed yet.
The AL5 session on vectors was fine. We had lots of time to practice and I felt comfortable with it at the end of the day. The C1 exam went well and I was pleased with my result. I was also really pleased with the result I got for the C2 exam and this has given me a great deal of confidence going forwards. As I have said before, I took C1 last year and didn't do well. It was nice to see the benefit of face to face teaching and realise how much I can achieve in the right environment. The trig has moved on quite quickly over the last few weeks and I need to take some time to revisit it before tackling the assessment we have for this. This is a target I will set myself for over half term. This is also the case for calculus. I am comfortable with the calculus up to as level but don't feel confident at all with it after that. I am more confident with the differentiation we have done, and know that I will be able to get to grips with this when I find time to sit down and look again. The integration, however, I felt completely lost on for most of the day on Tuesday 19th! We covered a huge amount and I was lost from the word go really. This is in no way Sam's fault- I lost my confidence and was then unable to do even the simplest bits. It was definitely the hardest day I've had on the course and came as a surprise after a very good day on Monday where I tackled complex numbers. I feel that I've made good progress on my project so far and feel confident that I will have it finished before the hand in date. Targets: • Review all trig after as-level • Review calculus • Continue to work on project

Table 6: Leone's reflective log – week 15-18.

10.2.3 Week 23

10.2.3.1 Keziah

Reflective learning log Week 23
Monday PR2:I worked on my project from home today. I finished the project and it is now ready to be handed in.
Tuesday Calculus 2:Today was good. The functions we are intergrating and differentiating are getting very hard now. I think in places it is my trig letting me down so I will make sure I go over that. I need to learn the different formulae in order to be able to work with them better.
Thursday Decision 1:Today was okay. I felt like some of the other members of the group were very disengaged making it hard for everyone to be on task. I did decision at a-levels so as Kat was going through different algorithms I could remember what they were.
Friday Statts 2: Today we had the stats assessment. I decided to do mine of 10km running results. I found this interesting as its something that I am personally interested in. I did a few different tests and also compared it to the normal distribution. I think it would have been better if I had edited my data more before the session however I didn't feel that I had been given very good guidance as to what to bring. I think clearer instructions about the assessment before hand would benefit how people do in the assessment. We were told as part of the assessment to just do any tests on the data that we wanted. I think clearer instructions to try and do stuff from ST2 would have been better. Overall I found the assessment fine but I think others would have benefited from better instructions.
Targets - Practice trig stuff that goes with calculus

Table 7: Keziah's reflective log – week 23.

10.2.3.2 Leone

Leone's week 23 log is not available electronically. Below is her log entry for weeks 22 and 23 from a paper copy.

> Again the work on complex numbers has been interesting. I am enjoying getting a taste of a topic without the worry of 'needing to know it for an exam' I feel relaxed and better able to learn. Again, calculus was difficult (both sessions) and I struggle to maintain a positive attitude during these sessions. I would find it easier if I had managed to consolidate my learning in my own time. I just haven't had the time or energy that I had at the beginning of the course to do hours of additional work to keep up. Discrete was fine, and was a bit of a MT day. Was interesting to see that our perseverance has improved on these kinds of tasks! C3 on Friday was a bit of a disaster. I knew the content but panicked and made mistakes. I was disappointed but not at all surprised as I've got myself very stressed about the C3/C4 exams. I worked incredibly hard on C1/2 content at the beginning of the course and haven't managed to maintain this level of work throughout. I know that if I had more (and a break!) time I would be able to complete C3/4 work to the same level as I did for C1/2.

10.3 Tutorial records

I have records of three tutorials each. The first is included below.

10.3.1 Keziah

Mathematics Enhancement Course
TUTORIAL RECORD NO: 1 DATE: week 2

REASON FOR TUTORIAL:

Ist tutorial – getting to know you.

DISCUSSION:

Going Ok – lot of work – hoping it'll be rewarding!

Has moved to Bath so no problem getting in in the morning.

Has done the MT1 practice work already.

Seems useful so far.

Really wants to teach A-level.

OUTCOMES:

Think about how to add targets to your reflective log.

Table 8: Keziah's tutorial record 1.

10.3.2 Leone

Mathematics Enhancement Course
TUTORIAL RECORD NO: 1 DATE: week 2

REASON FOR TUTORIAL:

1st week of course – how's its going?

DISCUSSION:

Journey time long but manageable,

Looking into doing AS-level.

Only person in class without a-level – must hang onto sense of progress rather than comparision

Identified changing the subject of a formula and writing equations from the information given

OUTCOMES:

Table 9: Leone's tutorial record 1.

10.4 Assessment feedback sheets

When work had been marked, it was returned to the students with feedback comments from the tutor. The student was expected to write their response to the feedback on the form as well.

The example included below is a blank form. It is included in order to show the nature of the assessment feedback sheet. The actual feedback sheets have been removed to avoid the risk of identifying either the student or the tutor.

MEC ASSESSMENT COVER SHEET

NAME:_____ DATE SUBMITTED: _____ ONTIME/LATE

UNIT: TUTOR: DUE DATE: 1st / 2nd submission

	(i) Acquisition of subject knowledge for concepts in the current unit	(ii) Ability to use fundamental mathematical definitions, conventions and methods	(iii) Ability to communicate
Outstanding or exceptional performance will demonstrate: (E:)	'Secure' knowledge' Extensive knowledge of topics covered. Ability to explain relevant concepts and links to other areas thoroughly. Depth of analysis.	Skills and techniques applied to unfamiliar examples in an elegant manner. Maybe inventive, making and pursuing insightful connections between topics.	Work that is composed elegantly and extremely easy to read; narrative flows. Mathematical notation and symbols used in a meaningful way throughout.
Evidence of Good attainment will demonstrate: (G:)	'Developing' knowledge Ability to explain concepts thoroughly and apply accurately.	Underpinning methods used efficiently and concisely. Methods that allow 'shortcuts' are recognised and used appropriately, including making connections across topics.	Concise, effective descriptions of work done. Explanation for choice of methods. Logical flow.
Baseline or 'Sufficient' evidence will demonstrate: (S:)	'New' knowledge. Ability to apply and explain relevant concepts, with a few gaps none of which may be vital.	Standard methods such as rounding and algebraic manipulation used appropriately with few errors, but perhaps inefficiently.	Work can be read with understanding. Presentation is sufficient and appropriate to the task. Method included in test/exams. Appropriate split between 'maths' and English in written work, but maybe descriptive.
Failure to reach a sufficient level of attainment will be demonstrated by some or all of: (I:)	Insufficient evidence of acquisition of knowledge such as: Errors in application of 'standard' methods Inaccurate descriptions Inability to explain reasoning and/or inappropriate application of 'rote' methods Errors of fact	Failure to use standard methods accurately. Misuse of terminology; definition; notation or symbols (including equals sign). Inappropriate application and/or choice of methods and failure to recognise the need for their use e.g. rounding.	Numerous careless errors Work is incoherent or confusing; insubstantial; verbose or inappropriate.

2nd Submission required?
YES / NO

Due Date:
_____

Tutor Comment on strengths and points for improvement:

Initials: __ Date: _____

2nd marker comment:

Initials: __ Date: _____

Student Response and indication of next steps:

Initials: __ Date: _____

Table 10: Assessment coversheet.

10.5 End-of-course interviews

In the interviews, I started by asking about critical incidents in learning maths. Note: I am S1 and Keziah/Leone is S2. I have included the beginning of these conversations below.

10.5.1 Keziah

00:01:22	S1	Right, okay. So the thing that I wanted to talk about was…I mean, I've got your sheet which I'm leaving to one side. What I wanted to talk about was sort of, have there been any critical events for you in any form in your journey through learning mathematics? So going right back as far as you want, so what has happened that's formed your experience of learning mathematics? Maybe there aren't any critical events, maybe it's all gone through smoothly in which case that's fine. So just sort of talk about you learning maths from wherever it feels important to start.
00:02:03	S2	I think the learning of maths throughout the course has been like fairly steady. I would struggle with some things and not so much with others so it just sort of put like in where I needed to. I didn't think there's any critical events that have happened. The only thing that, on this course, that would've happened is how, like I've said before, how negative other people have been and how that's impacted the learning.
00:02:28	S1	Can you talk about that a little bit for my…?
00:02:33	S2	Yeah, I don't know. I don't know if that was relevant. Well, I think it's, it has come from the facts that there's only such a small group of us. And then just if other people in the classroom are negative, that they just brings everyone's mood down, and…. I think if we all sort of would come in at the start of the day and was like, "Yes, right. We've got…we're here sort of 9:30, what can we learn, and we can we…" come and be positive, we'd probably learn a lot more and be a lot more happy. Whereas I think on this course, it's been quite, "oh, we're here, we don't want to learn," which is like silly because we're here to learn. Like, oh, it's just quite…what's the word I'm looking for? It's quite negative, negative learning, and that obviously makes it harder to learn.
00:03:24	S1	Is it possible to sort of tell a little story of an event or two where that sort of things of happened to you? Now without naming names or anything, but just to sort of give a bit more background. I've got the general sense of the negativity.
00:03:37	S2	Yeah. Sometimes, in lessons, so an event happened. So one of the tutor's write a formula wrong down on the board. They didn't realise why they'd written it down, but a few members of our group knew why they'd written it wrong and was like, "why is the tutor being so stupid?" I think that was one of the tutors that, perhaps, we hadn't warmed to as much because we don't see as much. And I think even since then there's been like a negative aspect on when we have that tutor and then furthermore having that tutor that no one seems to engage with it. Well, I do engage, but….
00:04:20	S1	No? Yeah. So did anybody at that time say to the tutor, "Is that correct, have you done it the wrongly?" like that, or?
00:04:29	S2	Yeah, yeah. So they said, "Is that formula on the board right? We didn't understand how that could work." And then the tutor was like, "Oh, I don't know." And then they're like, "Oh stupid, you should know." And then they like criticised him for the subject and just, you know. Every teacher makes mistakes, so I think we could probably learn from that and that we'll going to make mistakes like that as well, and that we shouldn't be too harsh on tutors. But, yeah, that was quite a negative day.

Table 11: Beginning of Keziah's end-of-course interview transcript.

10.5.2 Leone

00:01:48	S1	So what I'd quite like you to do is to just once I stop, I'd like you to just start talking about things and just talk for as long as you want. But I'd like you to think about what have been the sort of critical events in your experience of learning Maths. So you could go right back to being two years old if you want or you can start where you want to. But thinking about what have been sort of critical events that have changed how you view learning Maths or how you view being assessed in Maths or things that have changed your view of being a Maths learner in a significant way. But you can go right back and just start at the beginning or anywhere you want, it's up to you.
00:02:27	S2	Yeah. I lived in … from when I was five until when I was eight. And then when we moved back, I think we'd done…I've missed bits that English schools had done, I'd done things in a different way. And, so I was kind of always on the back foot in terms of that. And because I wasn't that strong at Maths, everything else, I just kind of picked up and carried on with, but that. So when I then went to build on it, I struggled a bit. And I think it was just assumed that I was always, so I was in top set for everything so I just got set at top set for you know, Maths, English, Science. And actually, I shouldn't have been in top set for Maths. So the way it worked in my school was that the top sets got given the worst teachers.
00:03:13	S1	Really?
00:03:14	S2	Yeah. And the kind of borderline students got the best teachers.
00:03:20	S1	Okay.
00:03:22	S2	So we had a really, really bad teacher. And then I got moved down a set and I got a better teacher but he still wasn't great. Yeah. I don't think … I just … when it came to doing revision for GCSEs, I was just like I don't feel like we haven't done any of it. And my mum tried to help me but I just had quite like fundamental things missing.
00:03:54	S1	Okay. So that's sort of going back to where you started from. Can you sort of illustrate a little bit about what was bad about the teacher in any way or what was bad but better?
00:04:05	S2	I can't even remember that.
00:04:05	S1	And if you can't remember, don't worry. Just if you can, flesh it out a little bit.
00:04:11	S2	I don't remember ever doing anything except for, "Open your textbook. We're going to do these questions on the board, and then we're going to do this exercise." That's all we … I don't remember doing anything other than that in Maths lessons. That's just how we learnt.

Table 12: Beginning of Leone's end-of-course interview transcript.

10.6 Using this data

In this chapter I have described my data sources.

Since the reflective logs were written throughout the course they form the backbone of the story of Keziah and Leone's journeys through the course. Other sources (tutorial records, assessment feedback) are snapshots at a particular time, and in the case of assessment feedback, a response to a particular occurrence. The end of course interview has the privileged position of being able to look back and draw on any aspect of the course. Thus, it could be used to gain more insight into previous events, or, to gain insight into current perceptions, which may differ from previous perceptions.

In the next chapter, I will describe my analysis of the data. I intend to use the reflective log as the primary document for analysis, followed by the end of course interviews. I will draw on the assessment feedback forms as secondary resources that can be used to illustrate points or add more depth if necessary.

Chapter 11: Keziah and Leone – narrative analysis

In this chapter I will analyse the data, beginning with the data extracts included in chapter 10.

I originally intended to move forward in time, considering the data in the order it was generated within the course, i.e. reflective logs first and end-of-course interviews last. However, I realised that, in fact, the end-of-course interviews needed to be considered first. When I undertook the interviews, I had not yet analysed the reflective logs, so did not know what issues would emerge for these participants. My focus during the end-of-course interviews was, therefore, still on the issues raised earlier by the pilot studies.

I will first look at the data generally before considering the extracts in detail, expanding to draw on the full set of data as appropriate. I will then compare Keziah and Leone looking for similarities and differences. This could have been achieved by presenting analyses of everything for Keziah, followed by everything for Leone before performing a comparison. I thought that I would gain more insight into similarities and differences if I compared Keziah and Leone step by step as I progress through the data. I therefore chose to analyse the matching text for each and compare before moving on to the next pair of matching texts.

11.1 Keziah and Leone

Keziah and Leone appear to be a fortuitous pair for comparison. They are both at the younger end of the cohort and would have gone through their schooling and university at roughly the same time. They both have PE related degrees, and both had taken time to work and build up experience of working in schools in order to prepare themselves for the MEC and subsequent PGCE.

11.2 End-of-course interviews

In the section below I will look at Keziah and Leone separately.

I am aware that what I said in the interview and how I said it will have influenced their responses, both in their choice of response and the manner in which they responded. I am, however, initially looking purely looking at what they said. The full transcripts are available in appendices 9 and 10 (pages 215-216). For both Keziah and Leone I have included a table of the extracts from the full transcript that I refer to below.

When I planned the interviews my aim was to identify any critical events (section 5.4.3, pages 57-60; section 5.4.5, pages 61-65, section 5.6.3, pages 69-71) that had affected their view of learning and assessment, gaining some insight into questions raised in the pilot study (see section 4.3.7, pages 41-42).

Had I done the narrative analysis before the interviews, the interviews would have followed a different agenda, most likely I would have discussed relationships with the group, with mathematics and with assessment/examinations, as these were issues that were raised in the reflective logs (section 11.3, pages 139-161).

11.2.1 Keziah

Extract	Keziah
1	I think the learning of maths throughout the course has been like fairly steady. I would struggle with some things and not so much with others so it just sort of put like in where I needed to. I didn't think there's any critical events that have happened. The only thing that, on this course, that would've happened is how, like I've said before, how negative other people have been and how that's impacted the learning.
2	I think it's, it has come from the facts that there's only such a small group of us. And then just if other people in the classroom are negative, that they just brings everyone's mood down, and … I think if we all sort of would come in at the start of the day and was like, "Yes, right. We've got … we're here sort of 9:30, what can we learn … we can come and be positive, we'd probably learn a lot more and be a lot more happy". Whereas I think on this course, it's been quite, "oh, we're here, we don't want to learn", which is like silly because we're here to learn. Like, oh, it's just quite…what's the word I'm looking for? It's quite negative, negative learning, and that obviously makes it harder to learn.
3	Sometimes, in lessons, so an event happened. So one of the tutors writes a formula wrong down on the board. They didn't realise why they'd written it down, but a few members of our group knew why they'd written it wrong and was like, "why is the tutor being so stupid?" I think that was one of the tutors that, perhaps, we hadn't warmed to as much because we don't see as much. And I think even since then there's been like a negative aspect on when we have that tutor and then furthermore having that tutor that no one seems to engage with it. Well, I do engage, but …
4	Yeah, yeah. So they said, "Is that formula on the board right? We didn't understand how that could work." And then the tutor was like, "Oh, I don't know." And then they're like, "Oh stupid, you should know." And then they like criticised him for the subject and just, you know. Every teacher makes mistakes, so I think we could probably learn from that and that we'll going to make mistakes like that as well, and that we shouldn't be too harsh on tutors. But, yeah, that was quite a negative day.
5	In the sense of that one, it's just like, because they're being so negative, it then spouts everyone into like not really engaging as much as they might do and that makes it hard to learn.

6	Sort of negative before it even happened.
7	Yeah, they were looking for stuff that they could complain about in a way.
8	I think they sort of pick and choose the days when that's going to happen. Some days "are we good" and some days "are we bad". But that's why I actually speak, I mean, they're always speaking about it in how one person's attitude can have such an effect over an entire class, and that how they can sort of tell them how everyone feels.
9	Because I've never been in that situation before whereas someone can really change their atmosphere.
10	It's more like … I don't know. If they are seeing it as like, I don't know, the people in the classroom are feeling negative, you can just feel that from their atmosphere and their presence that they're in a negative mood. It's really strange. But I can't think of any events, sorry.
11	It's more like an atmosphere than an actual event, I think, in the sense of what's happened throughout this one, I guess. I don't know
12	I had a really good teacher at A-Level, from my A-Level maths, and he was really good, and really inspired me to do maths. But my fellow maths teacher didn't like me and I didn't understand him at all, and I …
13	I think he thought that I put more effort into other subjects so he basically told me I was going to fail. But then I didn't because I went to my maths teacher and he taught me my further maths stuffs that I didn't understand. But I think, yeah, in that sense of like going back to like A-Level teaching, I learned really well from a teacher that I respected and get on with. But as soon as the teacher didn't respect me, I disengage and I didn't really want to learn from him. That's obviously when I was younger.
14	Yeah, he was not really very nice. He's just…I don't know.
15	He just didn't really respect me. And he didn't understand, like say if I hadn't done a piece of work, it wasn't that I didn't want to do it, it was because I had other stuff going on. Whereas my other maths teacher, I don't know, because he respected me, I'd always prioritise his work. And he'd always just helped me and be really nice. And if I didn't understand, he'd talk it through in a nice way. Whereas the other teacher, it would be like, "Oh, you don't understand," like … I don't know, I just …
16	And maybe he felt like a bit patronising or something, but I didn't understand, so. Then I just didn't really want to speak to him, so I spoke to my other teacher.
17	No, not for me anyway. I get on with other tutors, so I don't mind who I'm learning from.
18	Because some days they'll … you'll come in and everyone's happy and it's great. And then some days you don't.
19	I think, sometimes they feel that things aren't worth doing. So on a day …
20	For example, on a stats day, like I don't think that people feel they've learnt much during the stats lessons which you probably got from feedback as well.
21	If they knew we had stats, they'd come to me like, oh, I travelled all this way because I often commutes. Travelling all this way, and what, we weren't going to learn anything, like why are we doing this? Why we're here? Why we've got to do this sort of thing? But then in contrast, to a calculus day where you know you're going to learn quite a lot and you know that it's all really like, oh, where you can see the progression that you've made throughout the day. Everyone's like really like, "Yeah, we can do this. We are working hard. We're getting somewhere," I think it is seeing that progression and being able to say, "oh, we've done this, this, and this today", it makes everyone feel like happy, whereas …

22	But then like that's like the difference with the stats thing. It's like, oh, we're doing a bit of binomial distribution which you're going to look at on the computer and then everyone's like, oh, I can look at that on the computer at home.
23	I don't think that some of the girls mean to be negative at all. I think about, I don't think they're negative people. But I think, yeah, from what we've done on the course, they're like, "oh, I don't want to do these things", so therefore they're being really negative.
24	I just get on with my work by myself which is, yeah. That's sort of how I approach it when I realise there was nothing I could do, which I sort of stay and do stuff by myself.

Table 13: Extracts from Keziah's end-of-course interview.

11.2.1.1 Did Keziah encounter critical events?

Keziah did not think there had been any critical events in her time on the MEC, but does raise the issue of negativity in her peers and its effect on her learning (extracts 1, 5, 8). Whilst Keziah does not view other people's negative attitude as an *event*, she does see it as important enough to raise. She links the effect of negativity to the small size of the cohort (extract 2), in that it would be diluted in a larger group. She gives an example of a tutor making a mistake (extracts 3, 4), and how some of the group responded. She believes that there is some premeditation (extracts 6, 7), in that she considers someone is, or some people are, looking for faults to criticise.

Keziah is clear that she has never been in this sort of negative situation before (extracts 9, 10, 11), and even though Keziah may not see this as a critical event, I believe that it is because it has given her a new view of the world (section 5.4.3, page 57-60). The fact that she chose to talk about this when prompted for critical events reinforces the idea that it is a critical event for Keziah, even if she was not aware herself.

Keziah is very careful not to mention names of tutors or students even when asked explicitly if she would like to do so in this interview (extracts 17-22). At the same time, she is careful not to call anyone a negative person, but to see their negativity as arising from some cause (extract 23).

At the end of the course she is talking about "they", which appears to be the whole of the rest of the group, although that is not clear. Her response to the negativity is "I just get on with my work by myself" (extract 24).

11.2.1.2 Teachers

One of the questions raised in the pilot study was about reliance on teachers (section 4.3.7, pages 41-42). When asked whether any individuals have had a significant effect on her, Keziah described two teachers who had taught her prior to the MEC; a "good" one contrasted with another (extracts 12-16) with whom she had a less positive relationship. Hence, I identified mutual respect as important to Keziah for being a good teacher, but I did not manage to get any more depth on the issue.

There are, however, some clues in her reflective log, e.g. "Seaton was a very clear teacher, he took everything at a good pace and adapted what he was teaching us for what we needed" (week 2, Wednesday), and, "Sam is a good teacher. Things get really hard really quickly but he does it in a way that you don't realise" (week 17, Tuesday). Interestingly, in comparison with extracts 12-16, these comments from the log are about how the teacher teaches, not about respect.

In extract 13, Keziah says, "But as soon as the teacher didn't respect me, I disengage and I didn't really want to learn from him. That's obviously when I was younger." Perhaps as an adult she is seeing teachers differently, or maybe her understanding of herself in the role of a teacher in the near future has made her aware of teachers from a different perspective (extract 4)?

11.2.1.3 Assessment

I returned to the end-of-course interview transcript with a view to identifying any comments specifically about assessment – there were none.

Reflecting on Keziah's end-of-course interview, my sense of Keziah is that she is confident in herself; she sees situations around her but remains positive. She does not name people who caused her a difficulty, rather she talks about the circumstances and the effect on herself. It seems to me that Keziah is self-aware. She knows what she wants to achieve and works within the situation she finds herself, adapting her behaviour so that she continues to learn. I was surprised when I looked at Keziah's interview to see no mention of assessment, this makes me think that for Keziah assessment is part of the learning process, as it is for me.

Therefore it is not an extra, or a special, imposition. This is my theory, and it may be that Keziah would say something completely different if I were to get the chance to speak to her.

11.2.2 Leone

Extract	Leone
1	Yeah. I lived in … from when I was five until when I was eight. And then when we moved back, I think we'd done … I've missed bits that English schools had done, I'd done things in a different way. And, so I was kind of always on the back foot in terms of that. And because I wasn't that strong at Maths, everything else, I just kind of picked up and carried on with, but that … So when I then went to build on it, I struggled a bit. And I think it was just assumed that I was always, so I was in top set for everything, so I just got set at top set for you know, Maths, English, Science. And actually, I shouldn't have been in top set for Maths. So the way it worked in my school was that the top sets got given the worst teachers.
2	And the kind of borderline students got the best teachers.
3	So we had a really, really bad teacher. And then I got moved down a set and I got a better teacher but he still wasn't great. Yeah. I don't think … I just … when it came to doing revision for GCSEs, I was just like I don't feel like we haven't done any of it. And my mum tried to help me but I just had quite like fundamental things missing.
4	I don't remember ever doing anything except for, "Open your textbook. We're going to do these questions on the board, and then we're going to do this exercise." That's all we … I don't remember doing anything other than that in Maths lessons. That's just how we learnt.
5	In one way, happier because I was with all my friends but in another way a bit sort of like, well, I'm not pretty good at Maths then.
6	I mean I still got an A at GCSEs. It's all relative, how you view it, but I was an academic student who was capable of getting an A to start off, I just … And the only reason that I got an A was because I did so many past papers, not necessarily because I knew what I was doing.
7	I cried in every single revision session for Maths, and I cried in my GCSE exam. In my mocks, in my actual exams, after every single exam I cried, yeah. Because I just thought again, "I can't do it. I can't do it. I can't do it." Every single one.
8	I was like I would never … I was like absolutely the first thing that's going is Maths. I hate it. I can't stand it. Really, really hated it because I wasn't good at it naturally.
9	And that's something that I've only now, since doing this course, I've had to confront not naturally being good at something and having to work really hard to get there and kind of overcoming that.
10	I wanted to be a teacher and I looked at all my various options and it was kind of a process of elimination. And actually, it was one of those things that's always bugged me that I wasn't good at Maths. And I thought, no, because I'm not … And when I went to Uni and I got a first-class degree I said to myself, "Well, it's not that I'm not bright enough, I've just gone … somewhere along the line, my education on Maths has gone wrong." And the more I thought about it, I always want to prove a point that I can do Maths. It's not that I personally am not clever enough, it's just that I've just not been taught it properly or I've not … I've missed crucial bits that then have kind of impacted on my future learning. And I did a module that was kind of a bridge between GCSE and A-Level at Uni, we had to do one in first year sort of some of the stuff between the two, and I did fine in that. So I thought, well, it's not that I can't do it. It was almost …

	it's the one thing, it's like my one academic, has been my one academic real weakness and I just thought, "Oh, why not?"
11	I thought about teaching a couple of years ago and then since I did that, I worked in a school that I thought, "Yes, that definitely is the right choice for me."
12	It was a combination of things. My degree is in PE but I didn't want to be a PE teacher, so that was out. So then that only leaves you with Chemistry, Physics, or Maths really or MFL. I'm not going to do languages, because unless you've got a degree in anything else, it's not an option. So I thought, well … and actually, a lot of it was that my boyfriend now teaches Maths. He's not a qualified Maths teacher, but that's what he does because they're so short of Maths teachers. And I thought, "Well, if he can do it, I can do it." It's an opportunity to work hard on something that I've previously not been very good at. And I wanted to … it was a lifestyle thing as well. I wanted to be able to work where I want to work. And if I'm a Maths teacher I can work pretty much where I want to work.
13	So it was about opening up the doors. And then, so it was just lots of things. It's a route into teaching. I may well at some point decide to go back in special needs or I don't know what I'm going to do, but it was just I wanted to get into teaching and not have a really, really rough ride of not going onto the PGCE, not getting a job that you hear about with someone, so a PE graduate which is my boyfriend is a qualified PE teacher but there aren't any jobs.
14	There's been lots of times where I thought, "Actually, I'm not sure I want to do this," because I've never done something … I've never felt anything in my life that I actually failed things on this and it's not a nice feeling. And it's only getting to the end where you can go, "Okay. Well, that didn't kill me, I'm all right. Nothing really bad happened." But it's not … nobody likes to fail, especially not somebody who is used to not failing. So every time that happened and I didn't quit, that was quite sort of resilient. My resilience has grown just tenfold. I've still got a long way to go with it, but
15	I mean, not necessarily to do with mathematical, but knowing that I don't have to do everything perfectly and it will be okay. So my presentation yesterday, I didn't get to do very much work on it, but it was okay. It wasn't great but it was okay.
16	So actually, that's quite a big learning curve and it will help me a lot next year to know that it's good enough. It's not amazing, but it's good enough. And I've learnt that as well about my results, so all the pieces of work that we've done. We've had so many that it's not possible to always do everything perfectly.
17	So you have to prioritise and say, "Okay, well, I know I've done enough. It's not as good as I would've liked it to be so my project wasn't as good as I would've liked it to be, but it was good enough."
18	Being at the bottom of the class, I have never ever, ever, ever been at the bottom of the class before. And so now I have such a better understanding of what that feels like. So I will be able to actually be in their shoes and say, "Yeah, actually it is …" Sometimes you do have a day where you just think, "Oh, do you know what? I'm so fed up of being at the bottom of this class that I just don't want to engage today. I'm not doing it. I've had enough. I've had enough of …" And it depends. I'm quite an anxious, sensitive person. So for me, and it's every day of feeling like I'm at the bottom, it grinds you down. And you can see why students get to a point where they go, "I'm just not going to engage in this," or, "I'm just going to mess around because it's easier than trying and not being able to do it." And I've never had that understanding before and of finding something difficult, really difficult that someone else finds really easy. That's not ever been an issue. So that, I think that's been a really, really good point for me to learn. Because I've always been able to sympathise but not empathise.

19	And, so the way that I approach my teaching may well be a bit different and I may well … There will be times where I just think, "I'm just going to give them a minute actually to just …" And they're not deliberately being naughty or not paying attention. They are actually just a little bit overwhelmed and need to check it up for a minute.
20	Being this much under pressure for so long has brought out everybody's strengths and weaknesses. I liked it. Really to the front. Absolutely, everybody's best qualities and their worst are just out there for everybody to see. And yeah, it's been interesting but you have to be quite self-reflective I think. Because it does pull all of your worst qualities to the surface and you have to kind of go, "Oh, okay, yeah. Actually …"
21	So, I mean that's less to do with the Maths, this side of things, but just as a kind of personal growth point that in a way that I … I feel like I'm not really answering your question about learning Maths.
22	I think definitely, in terms of perceptions of assessment, I always used to like formally doing an assessment and getting a result because I always did well. So it was never something that made me anxious or I didn't want to do it. Whereas actually since being on this, I thought sometimes the marks I get for an assessment or how well I've done isn't actually a reflection of how well I'm doing overall. And, so I can see now how that can be less of a good thing than you might think. And it's more useful to look at myself in relation to where I was personally, not where I am within the group which is completely different.
23	I think if I've not done well in something but I've done much better than I would have done, it's that recognition of you haven't done maybe as well as other people have done, but actually, if you had done this a month ago, two months ago, three months ago, you wouldn't have been able to do it at all. So it's that kind of which you do say to me actually comparatively. Yeah. I mean, I think a lot of it is not necessarily to do with what the teacher does, it's to do with how people personally view feedback. I shouldn't look at what other people have got. I should just say, "Well, okay. This is what I've got." But in the real world that's not really how it works. Yeah. I think what would be ideal? I think it is important to have a mark. I don't think you can get away from say, this is what you got out of this many marks. I think because that's just the easiest way to see essentially how you're doing, but just … I'm very, very affected by positive or negative feedback. So if someone gives me positive feedback, if they say, "Okay, well you didn't do as well as maybe you would've liked," but if someone was saying positive, then I will be much happier than…because I'm quite sensitive. Whereas some other people might just read it and go, "Yeah, okay, whatever." But that's just me personally.
24	I'm a big fan of the praise burger.
25	Good, rubbish, good. I like that.
26	I know that it suits me well. It doesn't sit well with me to end on a negative, and it doesn't sit well to start on a negative, does it? So actually, it works for me to just have it in the middle.
27	It can get lost in translation.

Table 14: Extracts from Leone's end-of-course interview.

11.2.2.1 Did Leone encounter critical events?

Leone starts by describing coming back to the UK from another country at age 8 and being behind her peers mathematically due to differences between the two countries (extract 1). In my opinion, such a significant shift between cultures could

easily be a critical event, although it is not clear that it is. Leone says, “I wasn’t that strong at maths” (extract 1), but it’s not possible to say if this is a view she held prior to returning to the UK, or a view that was caused as a result of returning to the UK.

Leone was initially in the top set in her UK school but was moved down a set (extracts 1, 3). She must be talking about secondary school here rather than the school she was in on return to the UK. Beforehand she says, “actually, I shouldn’t have been in top set for Maths”, and afterwards “well, I’m not pretty good at Maths then” (extract 5). It is not possible to say if Leone changed any of her views as a result of the change moving down a set, so I am unsure if it could be seen as a critical event. In my opinion, her response post-move is confirming her view of herself prior to moving. Extracts 6, 7 and 8 reconfirm the same thing. It is clear to me that Leone held a low opinion of her mathematics ability, but more detail would be needed to examine how she came to form this view. Extract 9 makes it clear that she held the same view when choosing to start the MEC.

Leone describes how she came to be on the MEC (extracts 10 – 13). She wanted to be a teacher, which caused her to reconsider her relationship with mathematics. She considered various options to enable her to achieve her ambition of becoming a teacher. Certainly, her considerations led to her intention to confront her life-long belief that she could not do mathematics, but how much did she confront it?

Extract 14 is Leone’s response to being asked if there were critical events during the MEC. She does not give details of any specific events, but talks generically about not liking to quit. She sees not quitting as a success.

In extracts 15- 17, Leone does appear to be confronting her self-belief, explaining that it is not always possible to do everything perfectly and that there is a need to recognise what is good enough. I am not convinced that she has fully confronted this as she goes on to talk about how it feels to be bottom of the class (extract 18). Although she is describing her insight into how being bottom will help her as a teacher, I am left with the feeling that she *still* believes herself to be bottom of the class, when in actual fact she finished the course in the top half of the cohort. She achieved this despite everyone else having done A-level mathematics previously, therefore making considerably more progress than at least half her peers. In other words, there is a mismatch between Leone’s self-view and what her assessment results show.

11.2.2.2 Teachers

Leone had previously told me that she had had a teacher who had made her feel negative about mathematics. In extracts 1-4, Leone talks about teachers. She believes her school used the "worst" teachers for top sets and the "best" teachers for borderline sets. She does not give any details about how she distinguishes between a good and a bad teacher. She does, however, say that she remembers her mathematics lessons as taking the form, "Open your textbook. We're going to do these questions on the board, and then we're going to do this exercise" (extract 4).

Leone uses her own experience to reflect on how she would like to be as a teacher herself (extract 19). It's clear from extracts 10 to 14 that she wants to be a teacher rather than a mathematics teacher.

11.2.2.3 Assessment

Leone describes crying in examinations when she was at school (extract 7) because she believed she could not do mathematics. She believes she only did well because "I did so many past papers, not necessarily because I knew what I was doing." (extract 6), yet she describes herself as an academic student who should get an A. By contrast, in extract 22, she says, "I always used to like formally doing an assessment and getting a result because I always did well". My conjecture is that Leone expected to get top grades and it was when she thought that she may not that she became stressed.

Moving on, she talks about feedback. Marks are important for Leone, "I think because that's just the easiest way to see essentially how you're doing" (extract 23). She does not seem so happy with written feedback. As a tutor, I always try to give feedback in the format of "what was done well", "what needs to be improved" and to finish with "some praise for effort and/or improvement shown in the task". Leone also thinks feedback should be a "praise burger" (extract 24), which she describes as "good, rubbish, good" (extract 25). I find her use of the word rubbish telling. For me there is an implication here that if the work is not perfect, needing some improvement, it is rubbish.

Leone's end-of-course interview shows me that events from her school education have had a long-lasting effect on how she engages with mathematics. She does not appear to enjoy mathematics. She compares herself with others but does not appear to take account of having a different starting point, nor of having made more progress during the course than others. Gaining high grades is important to Leone, and is very hard on herself if she does not. As a result, assessment tasks appear to take on more importance, for Leone, than the mathematics itself.

11.3 Reflective logs

The first thing I notice about the week 1, 16 and 23 extracts (section 11.2, above) is that in week 1 both Keziah's and Leone's logs fill nearly a whole page of A4. In contrast, for week 16, Keziah's log is about half a page. So is Leone's. But note, the extract for Leone covers weeks 15-18, i.e. four weeks. Keziah's full log (appendix 7, page 212) for the same four weeks is around one and a half pages of A4, or three times as long as Leone's. In week 23, Keziah provides around half a page of writing, whilst Leone's entry is around the same length but is for two weeks (weeks 22 & 23).

In week 1 Leone reflected day-by-day, but in weeks 16 and 23 she wrote a single paragraph to reflect on a four-week and a two-week period respectively. By contrast, in all three extracts, Keziah is reflecting day-by-day. Indeed, looking at Keziah's full log (appendix 7, page 212) she does so every week throughout the course. By contrast, Leone uses the day-by-day approach only in weeks 1 to 4. There is no log entry for week 5, after which her entries tend to be one paragraph every two weeks, except weeks 15-18, which is four weeks. As a quick check, there are 9053 words in Keziah's log in total and 4740 in Leone's. There are one or two entries missing from the electronic version of Leone's log but that would only be a few hundred words, not a few thousand, so Keziah's log is approximately twice the size of Leone's.

Both are writing less later in the course than they did at the outset. It could be that there is more to write at the start when everything is new, or that they become more skilled at noticing what is important over time and focussing only on that, or many other reasons. Leone could be engaging less with her log than Keziah, or she could be writing more succinctly and with more focus than Keziah.

In the sections below, I will examine the content and begin to identify how they are using their logs.

Note: Having selected extracts for weeks 1, 16 and 23, I will, firstly, consider week 1 as the starting point. I will draw mostly on weeks 1-15 in this first section, but I will allow myself to draw on later weeks to illustrate points if necessary. I will then consider week 16 on its own. Finally, I will then consider week 23 as the end point, with the intention of drawing mostly on weeks 17-23.

11.3.1 Week 1 (through to week 15)

In week 1, Keziah and Leone are using their logs in a similar manner. Both have day-by-day entries. Leone has included targets on a daily basis, whilst Keziah has collated a set of targets at the end of the week.

11.3.1.1 Keziah

On Monday week 1, Keziah starts with "I met fellow students and tutors on the course", going on to say, "The day gave me a lot of different emotions, I felt excited to start as I really want to get back into maths, and feel nervous as to whether my previous ability will come back." She returns to considering the cohort, "There is a very small group of us completing the MEC course this year; I imagine we will get to know each other very well.", and "In the afternoon we went onto some maths to get our brains working …". Finally, she reports how she went to buy squared paper, acting on the advice on posters created by previous students. She rounds her reflections of the day off with "Going to be eat, sleeping and dreaming maths from now on!"

These extracts say to me that Keziah is showing determination to immerse herself in the course and take as much from it as possible. Her use of the word "exciting", is positioning her with a positive outlook towards the course at the outset. "Eat", "sleep", "dream" all indicate that she intends to immerse herself in the mathematics that she will be doing. She anticipates working closely with the rest of the cohort.

Reading through week 1 several times, I found my attention drawn to Keziah's use of first person pronouns *I* and *we*. She is reporting what is happening from a group perspective, for example: on Tuesday "… started us off"; "Dennis had come up with the solution …"; "he had used …" "which they proved to us …"; "the problems showed us so much more than just simple problems, we covered lots of things …".

At the same time she is thinking about her own thinking and next steps, for example: also on Tuesday week 1, “I was convinced …”; “good to see their way of thinking. I had tried to …”; “I found hard …”; “I cannot remember much I need to go away and brush up on a lot of these simple concepts”.

Her use of we could be simply a benign we, in the way of “the teacher asked us to…”, however Keziah’s use of we appears to me to be an inclusive we, e.g. on Wednesday “we could all see patterns going on but verbalising and expressing them was difficult.”; or, “… we were hoping … together we found a solution”; and “we had to test our brain and really think about what we were doing to come up with a solution, and when we found the solution the method and what we did was a lot more memorable”. She is speaking of her own experience of the activity, but she communicates that experience as a group experience, positioning herself as one of the group, whilst appreciating the value of the group to her personally, although, it is not always clear cut. Is she reflecting a difficulty the group encountered or how she felt herself? On Friday week 1, “Working in groups is really helping me as it’s giving me a lot of help and ideas that I probably wouldn’t come up with on my own.” Keziah is making it clear that she is finding group working valuable.

As the course progresses, from the first week of problem solving in groups into topic strands, Keziah continues with this mix of calm, measured, inclusive descriptions and individual reflections but with an increasing focus on individual reflection, e.g. “I found the fractals and how they can be never ending interesting …”; “ I couldn’t do quite a few and when I was shown how to do them it made a lot more sense”; “I enjoyed the 3D shapes, we found out a lot about them.” “I do feel that I need to create a more formal approach …”; “… I need it in more of a standardised form.” were all comments within the entry for the same day (week 5, Thursday). Although she is focussing more on herself, her own engagement and her own requirements, it seems to me that Keziah does not forget that she is part of a group. She retains an awareness of them as part of her thinking. For example, Keziah reports on the group “We got a bit confused in class over the rotation one … But we overcame this to find the solution.” (week 5, Thursday).

On Wednesday week 1, Keziah says “there were lots of periods of science [sic] where I think we were hoping Jayda would come in and help us, however she left us to it and finally we found a solution. This way of teaching is not something I am used

to, however I have found it very effective … and when we found the solution the method and what we did was a lot more memorable." She was thinking about what the tutors are doing, about its effect on her. I suspect she would also have reflected on its effect on her as a future teacher, although she does not say this.

"I liked drawing the squares task … I liked how it leads you on to proving Pythagoras" (week 2, Tuesday), or "I think this will get better with practice" (week 4, Thursday) or "I didn't understand this however it would be nice to get to grips with this" (week 4, Thursday). There is a sense of calmness and enjoyment as she highlights the parts that have gone well and the parts she needs to work on, giving me a strong sense of her having a relationship with mathematics. Although, in weeks 5 and 6, she comments that she has a lot to do, this does not appear to alter the positive nature of comments on all other aspects.

Over time, her comments appear to become slightly more functional, sometimes tending towards reporting what was covered in class and what work was set, e.g. "We ended the day on the website manga high which was good fun. We played a penguin game." (week 5, Friday). Whilst I do not know from this what mathematics Keziah was supposed to be engaged with, she still communicates her enjoyment and engagement effectively. I take this to mean that Keziah has settled into a work pattern where she is confident that she is engaging and learning in a similar manner as previously and therefore does not need to repeat herself. When something different happens, such as going to Maths Inspirations, she says, "… I think some of her ideas could help form the basis of the final project." (week 10, Monday) backing up my view that there is no point in her repeating herself for the sake of it, but that she does comment when there is something worth commenting on.

Keziah's log reveals someone with a positive outlook on life, whether she is reflecting on her own learning or the teaching. If she finds something lacking, she uses it as a learning point for herself. E.g. "When going over some of these I got confused as I felt it wasn't completely explained at first. … Luckily we went over these towards the end of the day so now I know." (week 3, Thursday). On Thursday week 6 she says, "I understood all the content in the end however I felt that some of it may have been over complicated at times" but goes on to say, "… I just need to go back over and clarify everything". She is fair to the tutor and allows space for them to be human, i.e. not perfect.

She does not criticise others, whether tutors or students, e.g. when looking at different multiplication methods she says, “I did start to get bored when we were trying to work out how one of the methods worked.” (week 2, Thursday). It’s not possible to say from this comment if the boredom arose from the way the task had been set, or the way her group were tackling it because Keziah keeps the focus on herself. I suspect, she was reflecting quietly on why she was bored and how she might address the situation in different circumstances, although she does not say this.

She rarely makes a negative comment, but when she does, she does so in the same calm manner, even explaining why there is not really a problem, e.g. “Only downside of today was that we were in a really awkward room where not all the chairs were facing the board making it hard to see, I think this was a one-off though!” (week 2, Wednesday). Another example of her criticisms being made in a low-key way occurs on Friday week 8 “Today was slightly tedious as the concepts we covered were hard to grasp …”, as usual explaining why she felt this way. Or when at Maths Inspirations she says, “The only negative in the day was … There were a group of very annoying boys sat behind us. This reminded of how kids’ attitudes to maths can be bad” (week 10, Monday). In my opinion, she turns a negative comment into a learning point. Continuing, she says, “On the other hand there was a well behaved and interested group sat in front of us, which showed that some students were there to engage and enjoy the show!” (week 10, Monday). It is as if she has purposefully found a contrasting group in order to give a positive point of view.

In week 8, her tone changes slightly. Keziah says, “Today there were only 4 of us in, therefore we didn’t do what was planned. I felt a little annoyed at this because it was almost like we were being penalised for coming in” (Thursday). This is the first time I detected a negative emotional response to a situation, although even when expressing her annoyance she is clear about why she feels annoyed. In my opinion, this is about fairness, there is an implication that if others don’t bother to attend, they should miss whatever was planned.

On Thursday week 14 there is a hint of some sort of undercurrent. Keziah says “some of the worksheets were slightly confusing and didn’t set the instructions out well but once we got going and understood what we had to do it was good. I’m not sure all the other members of the group thought the same ...”. Here, Keziah is

setting herself as slightly separate from the group as she is seeing the positive aspects of the activity they undertook. And the following day, “today Josie was away which meant there were only 5 of us. I found this really hard. I’m finding the small group hard to deal with as you are constantly under pressure. And if the people in the group are annoying or disrupting you can really feel it.” This is the second time that Keziah has mentioned the effect of the group on her. She is still careful to not be critical of specific individuals. Keziah’s criticism of the group is stronger here than the previous day. I feel that she is being quite circumspect in what she says, as if she does not want to be critical of the group, she wants to work as part of a cohesive group, she wants to stay positive.

The third mention is in week 14 [NB: this is not in the saved electronic copy of the log. I no longer have access to the paper copies nor the original emails], when Keziah says, “I am still finding a negative vibe within some members of the group. I would say I am a very positive person, however when others amt [sic] it can make the day feel very long.” It appears to me that Keziah is finding it harder to ignore whatever it is that is happening in the group. It is noticeable that she does not describe what is happening to make her feel like this, she simply alludes to it.

11.3.1.2 Leone

On Monday week 1, Leone starts with, “It was great to meet everyone today and find out a little bit more about them. It seems like a nice group and I hope that we will all be able to support each other to learn”, going on to say “I am worried as I’m the only person in the group who hasn’t done A-Level before- I’m so worried about being left behind!” She reports working on some mathematics with the group to which her response is two-fold. Firstly, “It was good to be able to see the different ways that people solve a problem and listen to their explanations.”, and secondly, “I didn’t contribute as much as I would have liked as I was lacking in confidence a little.”

At the outset, Leone’s use of “I hope” seems to be positioning herself in a positive but tentative manner towards the group, perhaps because she feels “nervous” and has a “lack of confidence” with regard to working with the group. The only other references to her peers in week 1 are on Monday, “We did some group work on

maths problems this afternoon"; "It was good to be able to see the different ways that people solve a problem and listen to their explanations."; "… not becoming stressed if I feel that I am falling behind others."; Thursday "I was pleased this morning to know that others had used similar techniques"; "It was great to follow the relatively simple proof of why the problem couldn't be solved after Alison's 'light bulb' moment"; Friday "we took algebra back to the start …".

Leone starts the day on Monday week 2 "with some trepidation". Although she continues to highlight the difficulties, she is also using her experiences to learn e.g. "This was good to do as I have always just followed algorithms blindly without thinking about it." On Tuesday week 2, Leone says "Today we looked at Pythagoras' theorem and the various ways of proving it. It was interesting to understand *why* we use the formula. It was a bit frustrating to start with when we had to look at the 100 proofs and find one that we could understand and present. I felt that I wouldn't be able to understand any of them!" So far, this extract seems to use the trivial or benign use of we, it is more general than the specific group, referring to society as a whole. Similarly, "when we had to …" is a way of speaking, rather than a specific reference to the group. Although she does go on to say, "Eventually *we* found one and I felt really pleased when I managed to get to grips with it and present it to the others" [my italics]. Here Leone is referring specifically to the group she is working with, but not to working with the group – her use of *I* in the rest of the extract puts the focus on Leone. In later weeks, I couldn't find any reference to groups nor we, other than in the trivial form.

This reconfirms my sense of a tentative link with the group. The group exists but not as an inclusive we. The only we Leone uses in week 1 is what I called above a benign we, as a result my sense is of Leone positioning herself side by side with the group rather than integrated into it. Rather than identifying similarities to the group, she comments on her differences from the group. She is the only one without an A-level in mathematics.

She has not only positioned herself as outside the peer group, but also, I believe, outside of mathematics. In week 1 she is pleased to go back to basics in algebra because "it's an area I find difficult". She indicates a positive approach to addressing weaknesses, "I am glad that I have found out that I am weak in the areas of writing

equations from information given and in changing the subject of an equation … It's good to get a chance to work on it now at the start of the course."

Confidence appears to be important to Leone. She refers to it several times in week 1. On Monday, she is anticipating difficulties ahead, e.g. "Getting overwhelmed, especially during C3/C4 content". On Tuesday she says, "I find 'out of the box' thinking quite difficult" and on Wednesday "I still find this topic difficult", going on to report "I had much more of an idea about where I might start. I also had more confidence to go with something …". On Thursday, "… this gave me confidence in my abilities".

She talks about the mathematics that she has encountered, e.g. "… prime numbers really interesting" (week 1, Tuesday); "I particularly enjoyed 'Who buys the beers?' problem" (week 1, Wednesday); "It was great to be able to follow the relatively simple proof …" (week 1, Wednesday); "…Pascal's triangle particularly interesting" (week 1, Wednesday); "I'm starting to see how properties of number are everywhere and I'm finding it fascinating!" (week 1, Thursday). She finishes the week saying, on Friday, "I am glad to have found out that I am weak in the areas of writing equations from information given and in changing the subject of an equation. These area weaknesses that I have found hinder me when studying maths to a higher level and it's good to get the chance to work on it now at the start of the course." As a result, I am getting a sense of Leone's confidence increasing a little, perhaps through engagement with the mathematics, which she has enjoyed and found interesting, if difficult.

Perhaps the group she is with is not important for Leone, perhaps she doesn't feel part of the group, or it could be that she is seeing learning only in terms of mathematics and is therefore not writing about other things. Although few and far between, I think that one or two hints emerge, e.g. "I would have found it useful to spend a little more time on surds but I understand that there are others who would get bored if they went at my pace." (week 3, Thursday); "It is still frustrating to get left behind because foundation knowledge isn't as good as some other people's" (week 21). I believe that rather than viewing herself as part of this group of students and identifying similarities, it could be that Leone, as a result of her mathematical background being different to everyone else, views herself as being what the group is not. She identifies the differences and thus places herself outside of the group,

using comparisons with the group in order to accentuate how she has positioned herself.

Although she says, in week 13-14, “I was however sat on a very supportive and inclusive table, which made it much easier to keep my sense of humour”, there seems to be some implication here of something having happened or changed, although, whatever it is, it is not made explicit.

Leone mentioned workload early on, saying, “I felt like I had a mountain to get through at the beginning of the day but managed to get a lot done and felt much more on top of things at the end of the day” (week 3, Monday). On Wednesday she says “there isn’t enough space in my head to be thinking about all of that quite yet.” And by the end of week 3, “… and was managing to keep up” (Friday) and “I found the algebraic fraction work very difficult and ended up getting upset as we went a little too fast for me and I wasn’t really understanding” (Friday). To my mind, there is an implication that Leone is working at the outer edge of her learning abilities, linked with an expectation of herself that she will understand everything immediately. There are no more explicit references to workload in the rest of Leone’s log, but there are references to the amount of work and her ability to keep up, e.g. “It seems like there is a lot to cover in a short space of time …” (weeks 6 & 7); “… with me really struggling to keep up with what we are doing” (weeks 9 & 10). She also often mentions how hard she is working, e.g. “I will need to catch up on the content missed. I will also need to catch up on expectations for work over Easter and the guidelines for PR2” (week 9 & 10); “I am very tired and have worked very hard …” (week 10); “… I don’t feel I have enough self-study time to go back over it …” (weeks 14 & 15).

It is noticeable after week 3 that Leone’s daily log entries have become a fortnightly entry. She does not, however, comment on why she has made the decision to change. But the pattern of what she writes remains the same, e.g. in weeks 6 & 7, “I felt slightly panicked …”; “I’m seeing the benefit of …”; “… I was very nervous about … and felt that my subject knowledge is really going to be a problem moving forward into teaching”; “I was much more confident …”; i.e. a mixture of anxiety and success. As the course progresses, the weekly reflections gradually reduce from half a page of A4 to a quarter of a page of A4, with the same pattern of mixed responses

continuing throughout, e.g. week 20, "… am happy to be able to follow the content" and "I don't hold out a huge amount of hope for my performance in exams!".

Despite initially seeing Leone and Keziah as very similar (section 11.1, page 129) their log entries in week 1 are showing differences.

Both are indicating engagement with mathematics, with Keziah using words like "excited", whilst Leone uses words like "enjoyed". Leone is, perhaps, taking a practical approach towards the mathematics, e.g. "I can see why it is useful to have this knowledge at your fingertips and how key it is for teaching" (week 1, Tuesday). On the other hand, Keziah, whilst the long–term aim is the same, appears to be immersing herself in the mathematics for its own sake, e.g. "The end task of the day was fun, but hard!" (week 4, Wednesday).

With regard to the group, Keziah is using the inclusive language of we and positioning herself within the group, whereas Leone is more likely to use I, positioning herself alongside the group. Keziah's we implies she is working with the group, whist Leone is explicitly comparing herself to the group. I believe that rather than viewing herself as part of the group of students and identifying similarities, Leone, the only one without mathematics A-level, views herself as being what the group is not. She identifies differences and places herself outside of the group, using comparisons with the group in order to accentuate how she has positioned herself.

Leone often mentions confidence. At times her confidence appears to increase, but more frequently there are comments about her lack of confidence or nervousness. By contrast, in Keziah's log I can only find her explicitly mention confidence once, "I feel confident with mechanics, but will go away and do some of the recommended exercises to make sure" (week 13, Thursday). My impression of Keziah is that she *is* confident, and therefore does not need to comment on this, indeed probably does not even think about her confidence to engage with mathematics, unless, as with Mechanics, there is some reason for her to notice her own confidence level.

Both mention workload. However, the way they talk about workload differs. Leone appears to be under a lot of pressure to work hard, but with insufficient time. I have searched Keziah's log for workload issues. As noted above, she comments in week 5 that she has a lot to do. In week 8, she says, "It seems crazy that one week I had 5 assessments to be doing all at once and now I have none!". The absence of any comment from Keziah implies to me that

she is happily coping with the workload. In week 10, she says, “I spent a long time working on it and was unsure how it had gone so really pleased that my hard work paid off”. As above she is commenting after the fact that she had worked hard, rather than whilst working, that she is finding it hard work.

By week 14, something has occurred or changed. Keziah talks about a “negative vibe” whist Leone needed a supportive table “to keep my sense of humour”. Neither has been explicit about what has changed, nor what triggered a change. This must have been important to Keziah because when asked about critical incidents in her end-of course interview, Keziah raised the issue of negativity within the group (section 11.2.1.1, pages 132-133).

11.3.2 Week 16 (on its own)

Keziah has continued to use her log as she did in week 1 with a daily entry and weekly targets. In the intervening time, Leone has changed to using a single entry for two weeks with targets for the next two weeks. There may be clues to why she has changed in the logs for the intervening weeks, but at the moment I am comparing the extracts for week 16 in their own right.

For week 1, above, I tended to draw on weeks 1-15, because I would be starting at week 16 with these extracts. Although I did at times look beyond.

11.3.2.1 Keziah

Keziah starts her log on Tuesday with “The day started very tense”. She describes how she felt about feedback on an assignment, “my feedback still wasn’t great”, and expands, “The comment about arithmetic slightly annoyed me as I feel I have been working really hard over the duration of the course to get really good with numbers, manipulating them and recognising things straight off, I felt this paid off as I did this very well in the exam and didn’t make silly errors however my feedback brought up that I needed to improve on this (I agree with continual improvement however I felt I had done well with the exam)”. Even though she is not entirely happy, indeed is feeling annoyed, she gives another point of view by relating the annoying comment to continual improvement as a good thing. These comments feel unusual from

Keziah in that she is showing her feelings more than she usually does, rather than seeing both sides.

She continues by describing how Leone responded to her feedback ("very upset"), going on to describe how she thinks Leone is thinking, "I also think she is under a lot of pressure …". I see this not so much as making excuses for Leone but more showing empathy for Leone by trying to see things from Leone's point of view, thus reinforcing my view of Keziah as inclusive of others.

11.3.2.2 Leone

Leone no longer identifies specific days in her log. In this case, there is one paragraph for four weeks (weeks 15 to 18) and it is mostly impossible to identify specific events. Leone does talk about her confidence, e.g. "I was also really pleased with the result I got for the C2 exam and this has given me a great deal of confidence going forwards". More specifically,

> I am comfortable with the calculus up to AS-level but don't feel confident at all with it after that. I am more confident with the differentiation we have done, and know that I will be able to get to grips with this when I find time to sit down and look again. The integration, however, I felt completely lost on for most of the day on Tuesday week 18! We covered a huge amount and I was lost from the word go really. This is in no way Sam's fault - I lost my confidence and was then unable to do even the simplest bits.

On a more positive note, "I feel that I've made good progress on my project so far and feel confident that I will have it finished before the hand in date."

There is no mention of the group or of her workload, however.

Moreover, there is no mention of Tuesday week 16, referred to by Keziah as "very tense". Keziah also stated that Leone was "very upset". If it is true that Leone was upset why does she not mention it? It could be that by the time, three weeks later, she wrote the log entry she had forgotten about it. It could be that she thinks the log is about reporting mathematics learning, not emotion. It could be that she does not want to dwell on times she was upset. Or, of course, it could be any number of other explanations.

The reason I specifically included week 16 is that Monday, the incident Keziah refers to, is still a strong negative memory for me personally.

First of all, there was some mix up with room bookings and we had to move from the room we were in originally. It took some time to get another room and we were eventually put into the computer room, which meant everyone was sat in a line behind computer screens facing me instead of seated in groups around tables. By the time we got there, quite a lot of time had been wasted.

The students were given the feedback sheets and their scripts of an A-level examination paper they had done in class a few days earlier. The expectation was that they read the tutor's feedback comments and wrote a response to it. Note that they had peer marked this paper in mutual pairs immediately after sitting it. They had then had time to discuss, in these pairs, to identify what they had done well and what they needed to improve on. Following that, the tutors added any additional points they felt were needed, being able to draw together different aspects in a way that the students may not yet do. We had worked this way throughout the course.

It is important to note that I only have logs and feedback sheets for Leone and Keziah as no-one else gave permission to use their data, so I cannot report what was said by anyone else about the day.

My memory of that day is strong because, instead of quietly reading their feedback and writing a response as they usually would, an intense discussion followed during which various students expressed discontent with feedback they were getting; not only about this task but much more generally. Comments from some individuals were directed at me personally in what I will call, since I am unable to report the exact details, an extremely unprofessional manner. It was a difficult morning for everyone present. As a result, I find it very interesting that Leone does not mention it. I am including the tutor feedback to Keziah and Leone for the task in question, and student responses below. These are taken from assessment feedback sheets as exemplified in section 10.4 (page 125).

Keziah – tutor comment:

> You have most of C1 securely under your belt. On the whole your work is very easy to follow. The only bit that brings this down is when you couldn't factorise the quadratic. You should take every opportunity to work without a calculator so that

you gain a higher level of “number sense” and more confidence in your own abilities.

The one area of C1 you struggled with was proof. This is what fundamentally makes mathematics what it is & is important. I suggest you spend some time on this to embed it further C1/2 pp149-158.

Also remember that concepts that are not included in C1 are still important such as circle theorems (Q10iii).

Overall well done!

Keziah - response:

I understand circle theorems, I don’t think I verbalised myself correctly and I just assumed that it was on a circle. I feel I am good at factorising & I would have been able to factorise it but with pressure of exam, my first thought was to use the formula and I just went with it. I think my ‘number sense’ is good and improving, I am confident but as it was just in class I thought using a calculator would be okay.

Leone - Tutor Comment

Clear work – easy to follow. You have a good level of ability with C1 concepts on the whole, but don’t forget the stuff from before C1 is also important and can come in at any point (see Q10iii). The two questions that caused you problems are related as both are to do with lines intersecting or touching curves. The areas to re-address are C1/2 pp68-75 Ex 2F. Overall well done!

Leone – response:

Will look again at circle theorems overall pleased with my result.

Keziah’s response challenges the tutor. She shows self-confidence and self-awareness. She is saying that she knows herself and what she needs to do”. She takes responsibility for the choices she has made. By contrast, Leone appears to accept what the tutor says without question.

I can see nothing in either of Keziah or Leone’s feedback and response to indicate what set off the discussion that ensued, although it is obvious from Keziah’s log that she is not happy with the comment on “number sense”.

As noted above, something had changed in the week 14 logs. Perhaps the Tuesday morning in week 16 was a result of this change. However, since neither Keziah nor Leone give any details, I cannot comment. Hence, I will now move forward to the week 23 extracts and use that opportunity to look back at the intervening weeks from 16 to 23 to see if there are further clues.

11.3.3 Week 23

Keziah has continued using her log on a daily basis, and submitting it by email, whilst Leone has continued submitting one paragraph that covers 2 weeks. She has submitted hers on paper rather than electronically.

11.3.3.1 Keziah

Keziah reports, “Today was good” (week 23, Tuesday); “Today was OK. I felt like some of the other members of the group were very disengaged making it hard for everyone to be on task” (week 23, Wednesday); “I found this interesting” (week 23, Friday). On all three days, she goes on to comment on what was achieved in class. Keziah, thus, appears to be still engaging with the course. She is still thinking about others in the group in her reflections, e.g. “I think clearer instructions about the assessment beforehand would benefit how people do in the assessment” (week 23, Friday), going on to say, “Overall I found the assessment fine, but I think others would have benefited from better instructions.” (week 23, Friday). This seems to me to imply that she has separated herself from the group somewhat, she is no longer using “us” or “we”, rather she says “others”. Her comment about others making it hard to stay engaged maybe a telling part of this, she is having to separate herself in order that she can stay engaged.

This also happens again, “I think some of the other members of the course arnt [sic] so happy with mechanics and sometimes get confused. I try to help as much as possible but I do tend to just work alone recently” (week 17, Thursday). Despite choosing to work alone, Keziah still thinks about her peers, e.g. “I think most of the others in the group felt the same about the day being overly boring” (week 17, Friday). She appears to be using I rather than we more frequently in weeks 18 and 19, although the inclusive we still appears from time to time, e.g. “… would help us more” (week 20, Thursday) or “I think we worked well together” (week 20, Friday). It seems to me that Keziah still wanted to be part of a group working together, but the group dynamic had changed.

11.3.3.2 Leone

In week 23 Leone says, “I am enjoying getting a taste of a topic without the worry of ‘needing to know it for an exam’, I feel relaxed and better able to learn”. I find this a telling comment. She has been aware of assessment and examinations throughout the course, having started out in week 1 as “the only person in the group who hasn’t done A-Level before”. As the end of the course approaches she no longer has assessment tasks to anticipate and worry about and so can feel relaxed. However, she is still feeling under pressure. She says, “I would find it easier if I had managed to consolidate my learning in my own time. I just haven’t had the time or energy that I had at the beginning of the course to do hours of additional work to keep up.” About a calculus class in weeks 22 and 23, whilst most of the log entry is taken up with examinations, she says,

> C3 on Friday was a bit of a disaster. I knew the content but panicked and made mistakes. I was disappointed but not at all surprised as I’ve got myself very stressed about the C3/C4 exams. I worked incredibly hard on C1/2 content at the beginning of the course and haven’t managed to maintain this level of work throughout. I know that if I had more (and a break!) time I would be able to complete C3/4 work to the same level as I did for C1/2.

Within the one week, Leone can be seen from two perspectives. Firstly, enjoying mathematics with no examination pressure, which is three sentences out of thirteen, but most of the rest of the entry, in fact eight of the remaining ten sentences, are about feeling intense examination pressure.

Returning to week 16, and reading forwards again to week 23, my sense is that Leone has become entrapped by her own response (needing to work hard) to assessment and examinations in particular (and achieve high grades). She is focussed on herself and does not mention the group at all. She appears to be wrapped up in her own concerns to such an extent that she has given up comparing herself to others. There is one exception, in the very last week she says, “Was interesting to see that our perseverance has improved on these kinds of task!” This comment refers back to the first week as the course was rounded off by returning to investigative tasks of a similar nature to the task in week 1. This raises the question of what made the difference? For instance, did the different type of work free Leone from thinking about assessment? Did returning to a context when she had

previously been aware of the group return her to that awareness? Or was her change of focus from herself to others caused by something else? However, her log returns to an examination focus immediately after the one sentence.

By week 23 Keziah has distanced herself from the group. In her end-of-course interview she referred to the rest of the group as “they”. It seems that Leone has become more focussed on herself. It is apparent that something happened around week 14 that changed how the group interacted.

11.3.4 Logs again

So far I have been attempting to read the logs as broadly as possible. I found my attention was initially drawn to how Keziah and Leone used their logs to position themselves with regard to the course, the group and the mathematics, as I read from week 1 to week 16. However, in week 23, Leone’s entry is mostly about assessment. Since I started out with a focus on students’ perceptions of assessment, I reread their logs specifically looking for references to assessment and found the following.

11.3.4.1 Keziah and assessment

Keziah’s first mention of assessment is in week 4. Although she did set herself a target in week 3, “Start revision for test!”, this does not feel like a comment on assessment simply a statement of work to do; as does her entry “We have been set our first piece of assessed work for algebra 2.” (week 4, Wednesday).

On Tuesday week 4 she says, “We got our first assessment back today, I got good for everything but felt I could have done better and maybe achieved more excellent. I do feel that my written work isn’t always the best as it’s always something I have struggled with. I must make sure that I clearly explain my work.” She does not mention what the task, or the topic, was. She did not mention previously when the work was set, so it appears to me that Keziah took the work in her stride. Her comment in her log is focussed on making use of the feedback she got from the tutor, which appears to be a positive engagement with the process.

It will not be effective for me to try to comment in this manner every single time Keziah mentions assessment in some form. I will, therefore, gather the remaining comments together in a table below and comment at the end.

Wednesday week 4	"Today we began with a mock test for algebra 1, I found it fairly straight forward and did well, I make a couple of silly mistakes but nothing to worry about."
Monday week 5	"We got given another piece of work today. I feel I have a lot to do"
Monday week 6	"We did the AL1 test this morning, I think it went okay however I am quite a slow worker and didn't have enough time to finish the test to the standard I would have wanted."
Monday week 6	"We got set the second part of the GT1 assessment today. I feel like I have a lot of work to do."
Tuesday week 6	"The AL4 assessment was tough! The morning felt long and hard. I think I may have made an error with mine as I think I included a few questions on my test that would have needed a calculator. I think I am sometimes too reliant on my calculator, and had just forgot somewhere about making the test completely non-calculator. I completed Josie's test, I think it was okay, there was only 1 question I got wrong and then I lost a few marks elsewhere from silly mistakes, marking the test was also hard, as we had not made the test and we had not sat it. It was essentially like doing another test to make sure that we understood how the mark scheme worked. Overall a very tiring morning."
Thursday week 6	"We got set the second part of our AL2 assessment, which I feel I have been properly prepared for."
Monday week 8	"I also handed the two geometry assessments in today, so I now have no assessed work to be doing. It seems crazy that one week I had 5 assessments to be doing all at once and now I have none!"
Thursday week 8	"We also got our AL4 assignment back, which I need to resubmit. After going through it this evening most of my mistakes were silly errors that I probably could have avoided. Not a good day."
Friday week 9	"It was our last session on AL3 today before our exam next Friday … We then spent the afternoon practising anything from the module that we wanted and then got help from Jen. This was quite hard, the practice questions she had given us were not easy and I ended up getting very confused over a particular question, but I think I understand it now. I feel that I understand all the concepts from AL3, just now need to make sure I don't make any silly mistakes when writing things down!"
Tuesday week 10	"We also got our GT1 work back, which I was pleased with. I spent a long time working on it and was unsure how it had gone so really pleased that my hard work paid off. We also got set work for the Easter holidays."
Thursday week 10	"I now need to revise for the stats exam and complete the mechanics assignment."
Friday week 10	"We started with the test. It covered all the aspects of algebra 3 and tested us well. Jen marked the tests within the day and I got 92% so am very happy."

Monday week 13	"I then sat my stats exam at the end of the day as I won't be in tomorrow as I have my skills tests."
Friday week 13	"Today we sat SATs exams, I thought they were okay. There is a large amount of different topics and I found some of the wording on the questions a little confusing but overall I am fine with all of the content. We also marked a core 1 paper, the mistakes I made were all silly mistakes that I could have overcome had a read the question better."
Friday week 15	"Today was the C1 exam. I felt that it went well and the peer mark came back as very positive. I felt I did a lot of revision over the Easter break and this has now paid off. I'm not sure I have left enough time to revise for the core 2 exam as much as I would like to."
Monday week 16	"We were moved into the computer room upstairs and then we received our core 1 feedback. I felt that the feedback was a bit hard as I had worked really hard for the exam and got a really good result, yet my feedback still wasn't great. The comment about arithmetic slightly annoyed me as I feel I have been working really hard over the duration of the course to get really good with numbers, manipulating them and recognising things straight off, I felt this paid off as I did this very well in the exam and didn't make silly errors however my feedback brought up that I needed to improve on this (I agree with continual improvement however I felt I had done well with the exam)."
Thursday week 16	"Today we took the core 2 paper. The paper was pretty hard and I found some of the questions were hard to understand. I think that is just the MEI exam board. I was pleased that I got over the required 80%. I found the AP and GP question particularly hard even though I felt like I had revised them well. In the afternoon I felt it hard to concentrate in geometry and trig but I think that's because I had used all my brain power on the core 2 exam."
Monday week 18	"I will be making a crib sheet of everything we have covered so I have it all in a condensed way so that I can use it for revision for the C3/4 exams."
Monday week 23	"I worked on my project from home today. I finished the project and it is now ready to be handed in."
Friday week 23	"Today we had the stats assessment. I decided to do mine of 10km running results. I found this interesting as it's something that I am personally interested in. I did a few different tests and also compared it to the normal distribution. I think it would have been better if I had edited my data more before the session however I didn't feel that I had been given very good guidance as to what to bring. I think clearer instructions about the assessment beforehand would benefit how people do in the assessment. We were told as part of the assessment to just do any tests on the data that we wanted. I think clearer instructions to try and do stuff from ST2 would have been better. Overall I found the assessment fine but I think others would have benefited from better instructions."
Friday week 24	"Took the C3 exam today. I felt the paper was okay. There was one question which I did really wrong which was annoying as I had

	revised it well and after I finished the paper I thought back and realised how to do it correctly, I think with pressure of the exam and time I just did what I could. I got 75% which is a pass. Although I'm slightly disappointed I didn't do a bit better as I had spent a lot of time revising and I do feel that I know the core 3 content well. We then went onto AL5 in the afternoon. I think that doing an exam and then AL5 is not always good as people are so mentally tired from the exam it is then hard to keep engaged for the rest of the lesson."

Table 15: Keziah and assessment.

Keziah appears to be engaging with the tasks rather than seeing them as an assessment. She comments on how she will prepare herself for a task (e.g. week 9, Friday; week 18, Monday); how the task was for her (e.g. week 13, Friday); sometimes how the tasks could be improved (e.g. week 23, Friday) and about what she has identified that she can improve on (e.g. week 6, Tuesday).

11.3.4.2 Leone and assessment

Leone's first mention of assessment is on Monday week 1, i.e. the first day of the course where she talks about being the only one without an A-level in mathematics, going on to say that she sees, "Getting overwhelmed especially during C3/C4 content" as a stumbling block. Moreover, one of her first day targets is to "Discuss taking AS-level with JS", indicating that she intends to sit AS-level mathematics in the summer towards the end of the MEC course. On Tuesday, her target is, "Enquire at local schools regarding AS-Level entry". I surmise from this that it is very important to Leone to gain the mathematics qualification she feels she is lacking.

Whilst reading the log to identify assessment related entries, I am noticing that Leone relies on the A-level textbooks. Her targets on Friday week 1 are "Complete exercise 1B on writing equations in the C1/C2 book" and "Complete exercise 1C on changing the subject of an equation in C1/C2 book". In week 2, she refers to textbooks on three of the five entries are on Wednesday, "Look through relevant pages in C1/C2 book."; on Thursday, "Look through pages 130-137 in C1/C2 book." and "Complete exercise 5B Q1-8"; on Friday "Complete exercise 1D in C1/C2 book." and "Get the CGP GCSE and AS-Level workbook and start to work through them.". In fact she says on Tuesday, "It was good to get some extra textbooks after the tutorial

to go back and practice changing the subject of an equation. Having worked through the exercises I now feel more confident with it", and on Thursday, "I like being given the relevant pages that I can then work from for homework to cement what we've learnt." On Monday week 3, Leone comments, "I have now started to work through the CGP GCSE book, which I think will help, and have been looking through the topics we have been covering in the C1 revision guide." It appears to me that for Leone textbooks and examinations are in some way an integral part of learning mathematics. Moreover, she appears to me to have a closer relationship with her textbooks than with her peers.

When Leone cuts down from daily entries to fortnightly entries, initially she continues to list targets at the end of each entry, most of which contain a reference to working from a textbook. However after week 10, "Revise all C1/C2 content and start to look at some past papers."; "Revise stats for the exam on 14th April."; "Look at past SATs papers in preparation for the test.", it is rare to find specific targets at the end of her entry. Those that exist are focussed on wide ranging revision, e.g. from week 20, "Review C3 content"; "Try practice paper".

Returning to search for assessment related entries, in week 5 there were self-study days on Monday and Tuesday. Leone's log entries are on Monday, "I spent the day going through coordinate geometry and completing practice questions in the Edexcel textbook. I also completed the AL2 assignment and went through the content of C1, C2 and M1 in conjunction with the MEC handbook to make sure that I'll be ready in time for the exams in May/June" and her target, "double check timetable in conjunction with exam content."; on Tuesday, "Today I went through what we've learnt on logs and spent time completing questions given out in class and from the textbook. I also started to research and write my AL4 assessment questions."

As with Keziah I will put the remaining comments into a table.

weeks 6/7	"I really think this will help me during exams and in teaching"
week 10	"I concentrated on AL3 revision on Thursday night and managed to achieve a good result on Friday, which is a nice surprise"
week 13	"I worked hard over the Easter period to consolidate my knowledge on C1/C2 and will continue to work through the content until the exams in May"
week 13	"The stats exam on Tuesday was alright and I was glad to pass with not having had a large amount of time to revise as I was concentrating on C1/2"
weeks 13/14	"Friday was an exhausting day with the SATs tests and reviewing the C1 paper we had done! I felt very nervous about SATs tests and was very aware my result would be going in my midpoint review. It was a huge relief to have achieved a good score"
weeks 14/15	"I was disappointed to find out that I needed to re-sit the SAT… "
	"Monday was fine and it has highlighted areas I need to work on for C2"
weeks 15-19	"The C1 exam went well and I was pleased with my results. I was really pleased with the results I got for the C2 exam and this has given me a great deal of confidence going forwards. As I have said before, I took C1 last year and didn't do well. It was nice to see the benefits of face to face teaching and realising how much I can achieve in the right environment".

Table 16: Leone and assessment.

Leone's log entries were short, therefore the number of comments on assessment is limited.

Looking at the comments drawn together, Leone's focus is purely on passing or failing. She does not comment on any other aspects.

Keziah and Leone are responding to the tasks differently. Keziah is using the tasks formatively and is critiquing the process, whilst Leone wants to pass with a good grade. It is not apparent from her log whether she uses the tasks formatively.

To give some context, I should explain that many of these tasks were examinations and were sat in examination conditions. However, our intention was to use them as formative learning opportunities. Once a test has been completed, the students would be paired up to swap work and mark each other's paper. They would get immediate peer feedback, sitting in pairs to discuss whichever aspects of the test they wished. In addition to feedback on their own work, the tutors felt that familiarity with tests and mark schemes would also be useful to the

students as they progressed on to become teachers. Our aims in using tests in this manner were communicated to the students throughout the course. Following their paired discussions we would often have a class plenary discussion about the task itself, where we would discuss issues such as, how does it feel to be sitting an examination; how helpful is it to have immediate feedback from peers; does knowledge of the mark scheme help in any way; or any other issues that were raised during the discussion.

Keziah appears to have responded to our encouragement and used the task in the manner we hoped for. I do not know whether this is down to the culture of the course, or to Keziah's own expectations and ways of working already matching closely to ours. From her log, Leone does not appear to have engaged with this mode of working. Nor does it show me why she remains focused on pass or fail.

11.4 Tutorial records

As could be seen in section 10.3 (page 123), the tutorial records give a very brief description of the discussion held and there is no text to analyse, however there is some relevant information reported.

11.4.1 Keziah

In week 2, Keziah discussed settling into the course, which appeared to be going well, "seems useful so far"; "Has done the MT1 practice work already".

In week 9, Keziah reported "miswriting" and that she "finds it hard to work in the evening as is generally tired." She also says she was to sit a dyslexia test. Although it is not reported in any of the documentation, Keziah was found to be quite badly dyslexic.

In week 16, Keziah raised the issue of the atmosphere in class with her tutor and discussed strategies to deal with it, although these what these strategies are is not reported.

11.4.2 Leone

In week 2, Leone discussed the fact that she was the only one on the course without an A-level in mathematics. The discussion included the idea that she should focus on her own

sense of progress rather than comparing herself with the others. She also notes her journey time as a problem.

In week 9, she reported “feeling MUCH more confident”, at the same time reporting that she was “worried about getting through the AS content in time” for an AS-level mathematics examination that summer (which she had entered herself for). She was happier about her travel time as it “is better with Weds off”.

The third tutorial, week 18, focussed on her feeling more confident having done well on an AS-level paper on the course. The tutor reported, “a visible change in your body language and you are engaging with the maths without being afraid of getting it wrong.” There is an implication here, in what is not said, that Leone’s body language had previously indicated lack of engagement and a fear of being wrong.

11.4.3 Comparison of Keziah and Leone’s tutorials

The tutorial records confirm my sense that the group is important to Keziah, the incident that occurred in week 16 (section 11.3.2.1, pages 149-150) was discussed by Keziah and her tutor and they identified strategies Keziah could use to cope with a negative atmosphere amongst her peers. By contrast, Leone does not mention the atmosphere in her tutorial and had not mentioned it in her log (section 11.3.2.2, pages 150-152).

It is hard to draw any conclusions from the limited amount of text available, but it appears to me that Keziah is working out how to engage with doing the mathematics, whilst for Leone examinations appear to be her definition of doing mathematics.

11.5 Assessment feedback sheets

Ideally, I would analyse the assessment feedback sheets in detail. However, there would be a significant amount of work involved to do a full analysis, and as such could form a future project in their own right. Despite this, they are available here to draw on if necessary.

11.6 Overall Comparison of Keziah and Leone

11.6.1 Keziah

Reflecting on Keziah's reflective log vis-à-vis her end-of-course interview, my sense of Keziah is that she is confident in herself, she sees situations around her but remains positive. She does not name people who caused her a difficulty, rather she talks about the circumstances and the effect on herself. It seems to me that Keziah is self-aware. She knows what she wants to achieve and works within the situation she finds herself, adapting her behaviour so that she continues to learn. I was surprised when I looked at Keziah's interview to see no mention of assessment. I believe she sees assessment as part of the learning process.

11.6.2 Leone

Throughout the MEC, Leone's reflective logs showed her reliance on textbooks, which appears to stem from her school experiences (section 11.2.2, pages 134-139). It seems that getting grade A, or handing in perfect work, has been more important to her throughout her life than making progress and learning, which perhaps explains why she is still, at the end of the course, seeing herself as the bottom of the class. She has made more progress than the others, but still does not have an A-level in mathematics, unlike the rest of the cohort.

Despite their initial appearance of similarity, Keziah and Leone engaged very differently with the course. When I first met this cohort, Leone positioned herself as the only one without A-level mathematics. Throughout her log, Leone indicated how hard she was working in order to do better than she had previously, which indicates that she believes she can achieve through effort. The way Leone and Keziah work is very different. Leone appears to work in a way she was taught at school, working at home on exercises from textbooks and doing lots of past A-levels papers. By contrast, Keziah appears to have taken on board the mode of working encouraged by the course tutors. She works with her group on tasks set by the tutors. Keziah seems at ease with herself and even when the situation is not perfect, adapts her manner of engagement to fit the circumstances she finds herself in. On the other hand, Leone appears to be repeating the same manner of engagement as in previous mathematics learning situations.

It seems to me that Leone's reliance on her textbooks indicates a reliance on correct answers. She is explicit about marks being important to her in order to know how well she is doing. These are two

issues that were raised by my initial pilot study (section 4.3.7, pages 41-42), which showed that across the cohort there was a reduction in this reliance over the length of the MEC course. However, there does not appear to have been a reduction for Leone as in the end-of-course interview it is clear she still relies on marks (section 11.2.2.3, pages 138-139). Moreover, she does not seem happy with using the feedback given by the tutors (section 11.2.2.3, pages 138-139), once again going against the findings of my pilot study (section 4.3.7, pages 41-42) which showed that, across the cohort, reliance on other methods decreased and reliance on feedback increased.

Keziah does not say much in her end-of-course interview about how she knows how well she is doing, but she always responds to tutor feedback on assessment tasks, and acts on it. For example, responding to the tutor comment:

> This is a high quality piece of work. You have communicated clearly what you ae doing. Your comprehension paper shows excellent understanding. You have clearly mastered C4 concepts, with the exception of vectors. … (feedback on a C4 exam paper).

Keziah says:

> Good comments, I feel that I understand C4 well apart from vectors. I did a lot of revision & feel I have got to grips with them better but it was a tricky question. I will spend more time working on them as they are quite a big part of C4.

Not only does she respond to it, but in some respects she appears to have moved beyond the need for it. From this extract, it is clear that she knew in advance what she needed to work on and had done so. In section 11.3.2.1 (page 149) she is cross about being told that she needs to work on something that she is already aware of. In other words, she is giving me the impression that she is self-reliant.

The contrast between Keziah and Leone reminds me about an issue I raised previously in my pilot study (section 4.4, pages 43-45) when I considered whether I should collate the themes I had identified, such as correct answers or feedback under two overarching headings of internal and external factors. I did not do so at the time, but when I contrast Keziah and Leone now I feel that Keziah is using internal factors whilst Leone is reliant on external factors. I therefore intend to return to the literature in the next chapter to explore the idea of internal and external motivations, which I hope will not only enable me to gain more depth of understanding to the contrast between Keziah and Leone, but also to bring into my considerations the issues that were raised previously by my pilot studies.

Chapter 12: Motivational orientation

Through interrogating Keziah and Leone's narratives in chapter 11, I identified a difference between how Keziah and Leone engaged with the MEC. There appeared to be a pattern of Keziah being motivated by internal factors, whilst Leone was motivated by external factors. Although, as I will discuss below, the idea of internal and external are inconsistent with an enactivist frame. If such a pattern exists, I would be able to use it to help in interpreting observed actions.

In this chapter I intend to draw on the work of others to examine issues surrounding (internal and external) motivation.

12.1 Use of literature in this chapter

In section 8.6 (page 110) I raised the issue of multiple perspectives in enactivist research. Multiple perspectives could be provided through several researchers' interpretations or by one researcher using different frames or theories (Reid & Mgombelo, 2015). The frames and theories used do not have to be consistent. I am working on my own and cannot, therefore, draw on the interpretations of others on the data and analysis within this theses, so I need to be able to get views on the data myself from different perspectives. Reid and Mgombelo (2015) argue just that point, saying that what is needed is "multiple consensual contradictory perspectives" (p. 180), going on to say this can be achieved by a single researcher through the use of different theoretical perspectives.

Moreover, in an enactivist world there is only observing and interpretation of that observation by the observer (Reid & Mgombelo, 2015). Hence, I intend to gather the observations and interpretations of others through a brief literature review and attempt to clarify the internal/external inconsistency, by drawing on writing about locus of control and motivation from a range of sources.

In reporting from the literature in the following sections I intend to report the ideas using the language of those papers before reflecting and overlaying it with my own interpretations.

12.2 (Re)defining internal and external

Previously, I touched briefly on the idea that the results from the pilot study might indicate a shift from relying on external factors, which are outside the individual's locus of control to internal factors, which are within the individual's locus of control. For example, moving away from reliance

on teachers (external) towards students knowing how well they are doing themselves (internal) (section 4.4, pages 43-45).

Now, my understanding of cognition is that there is no boundary between an individual and their world (section 8.4.3, page 104). So the idea of internal and external becomes meaningless. Yet even as I write that, I find that, despite the contradiction, the words and the idea of internal and external factors and motivation still hold meaning for me and have occurred more than once in my investigations so far. Hence, I need to be clear about my meanings of these terms.

The idea of structural coupling (section 8.4.4, pages 104-107) explains that there is no boundary between the individual and the world. To repeat verbatim "Vörös et al. (2016) say the world and the individual co-determine each other, whilst remaining distinct from each other." (page 105), For example, observing a group of students working on a mathematics activity together, my colleague and I observed the group working silently and apparently individually. We observed repeatedly that when one spoke sometimes a conversation ensued in which it appeared that everyone was in tune with each other, sometimes finishing each other's sentences, or describing how what they had done added to, or gave an alternate explanation to what had been said. Then, without any discernible signal, the group would stop talking and return to working silently side by side, apparently happy they were working on the same problem together (Stansfield & Vaughan, 2013). In some form they are acting as one, yet each is a distinct person. This is illustrated by Simmt and Kieren (2015) using the diagram below.

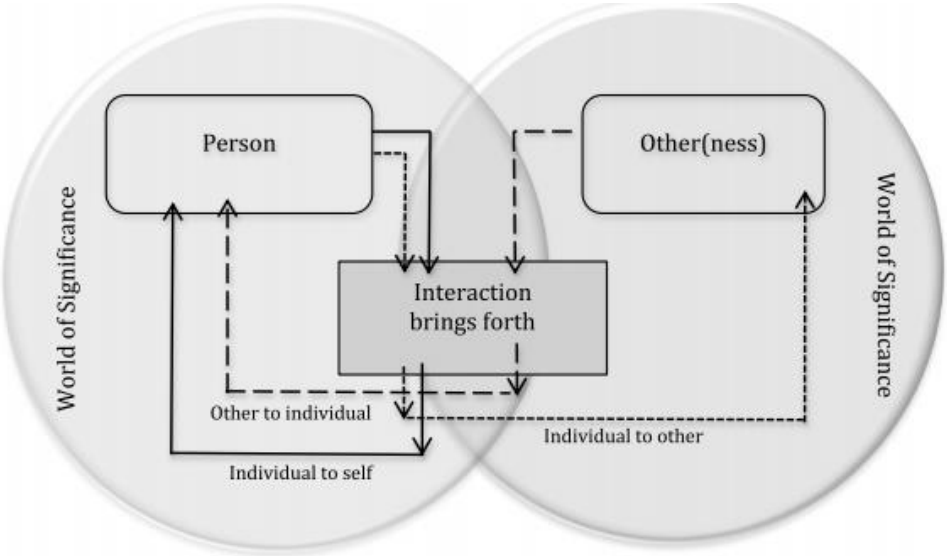

Figure 2: Interaction that brings forth a world of significance (Simmt & Kieren, 2015, p. 311)

In my example above, the world of significance they were mutually creating was the solution to the problem they were jointly solving as they engaged with the mathematics problem.

As shown in figure 2, whilst working together, two people (or a person and their environment) are affecting each other; changing each other. Their thinking is linked, yet in everyday language each will likely perceive the other as external to themselves despite their interaction affecting how each perceives the world (internally to them self).

Davis and Sumara (2006) describe cognition as "nested in – that is, enfolded in and unfolding from – collective activity" (p. 65). In other words there is no inside or outside, which brought to my mind an image of a flexagon (Knowles, 2016). The faces of a flexagon fold into the interior of the flexagon only to reappear again. All the faces are present all the time, but a person flexing the flexagon can only see, or observe, two at a time. My point here being that none of the faces are internal or external to the flexagon, they are all equally part of the structure of the flexagon.

Whilst the flexagon is immensely simpler to consider than human cognition, it gives the idea of no inside and outside since none of the faces are internal or external by nature; they are simply of the flexagon. Similarly, in the human interaction the joint thinking is neither internal nor external to either person but shared by both concurrently.

12.3 Observation and labelling

An ant crawling on the flexagon could insert itself between the folds and see different faces of the flexagon to a human observer who is too large to do that. Over time folding and refolding the flexagon, all the faces will be visible at some point to the ant and to the human. The human might chose to label the faces they can see as external and those they cannot as internal. But a moment later that has changed.

In other words, what the observer observes depends on their vantage point and is of that moment.

This applies both to my own observations and subsequent interpretations and those of the authors I read below. They observed, interpreted and drew conclusion in their own way from their own vantage point. Just as with the ant and the human above, even if they interpret and label differently to me, they will give a new view to consider.

12.4 Some views on “internal” and “external” factors

In sections 12.4.1, 12.4.2 and 12.4.3 (pages 168-171), below, I am reporting the views of several people in the language they used in their papers. Following that, I report on my reflections and interpretation of their work (pages 171-175).

12.4.1 Mindsets

Initially, I thought of Dweck’s (2017) *mindsets* as a possible way to describe the difference I had observed between Keziah and Leone. In Dweck’s (2017) terminology, an individual with a *fixed* mindset believes that they have fixed ability and cannot, therefore, become better at the task in hand. This reminds me of when I have taught people who say, “I can’t do maths” as an explanation of why they have not done a piece of work. I have also attended parents’ evenings as a teacher where parents excuse their child’s lack of engagement with mathematics by saying, “Oh, I was never any good at maths. They get it from me.” By contrast, an individual with a *growth* mindset believes it is possible to get better at something by engaging with it and working hard.

Summarising Dweck’s (2017) view, for those with a fixed mindset the outcome is the most important aspect. For example, they need to be better than others, or achieve top grades. If they do not manage the outcome they see themselves as failures. They will often blame those around them for their failure. By contrast, those with the growth mindset value their engagement with the task. They take ownership of the outcome, whether success or failure. They are more likely to learn from the experience of failure, and they are more accurate is assessing their own capabilities than those with a fixed mindset.

12.4.2 Locus of control

Locus of control gives a slightly different view to that of mindsets.

Joelson (2017) describes locus of control as falling into two categories, internal and external. According to Joelson, a person with an internal locus of control will attribute their success, or failure, to themselves, whilst those with an external locus of control attribute it to things in the environment. He describes how people with an internal locus of control tend to be in better jobs. They are more likely to learn since they believe that their own efforts will make

a difference. Those with an external locus of control tend to be more anxious as they are not in control of what happens to them. He describes how, in his experience, people are either *internals* or *externals*. However, he does not see this as an inborn trait, quoting unspecified research, which shows that people whose parents encourage independence are more likely to be an *internal*. The labels internal and external seem to me somewhat interchangeable with the labels fixed and growth. However, whether referring to fixed and growth mindsets, or to internal and external locus of control, the difference between each pair appears to be a black and white, bipolar relationship, with no grey in between.

Joelson (2017) reckons that he can quite quickly categorise people as *internals* or *externals* by how they speak about themselves. In his examples, the *internals* begin sentences with I, taking control of what they are doing, whilst *externals* use the passive voice where things are done to them. I would question if it is always this simple, i.e. does everyone operate with either an internal locus of control or an external locus of control? Amongst others, Harter and Jackson (1992) and Nowicki (2016) also questioned whether locus of control is bipolar.

Rotter (1966) developed questionnaires to measure whether individuals viewed themselves as internally or externally motivated, which he says are remarkably reliable. Nowicki (2016, pp. 44-47) describes a locus of control questionnaire, of the type developed by Rotter (1966), to assess how internal or external a child is, by answering a series of questions and computing a score on a scale of 0 to 40. Doing this myself, I scored 13 external and 27 internal, which placed me in the average category, where the description was not a good fit for how I know I work. Nowicki (2016) recommends checking the answers to see if they fall into groups where the individual may be internal in one area and external in another. I found that I was external on 6 questions that related to parental control. Since it was aimed at children, I removed those and then fell into the internal category where the description better fitted my work ethic. Nowicki (2016) states that using similar scales has shown that people who are internal, amongst other things, are more likely to achieve more academically, stick to a diet, complete a course of medical treatment or run a successful company than people who are external. It could be that a questionnaire of this type could have been used in a study such as my original design (chapter 6, pages 73-88) to see if students' locus of control changes across the duration of the course and by how much.

12.4.3 Motivation

Harter and Jackson (1992) investigated whether school children were intrinsically motivated or extrinsically motivated across a range of school subjects. They found that some children were always intrinsically motivated, some were always extrinsically motivated and some were sometimes one and sometimes the other, implying a continuum between the two extremes. Interestingly, they also found a correlation between the child's self-perception of competence in each subject and their locus of control. Moreover, their locus of control varied with their perception of competence in each subject. Indeed, they found that the self-perception and levels of intrinsic/extrinsic motivation remained correlated as both changed over time. Harter and Jackson (1992) go on to say that the relationship between locus of control and self-perception could be circular in both directions, with an increase in self-perception leading to an increase in intrinsic motivation leading to a better self-perception and so on, or equally may reverse and decrease in a circular manner.

Zimmerman (1995), citing Bandura (1993), says that having knowledge and skills is insufficient to perform well. Self-perception plays a large part in how an individual performs academically. In their study of motivation, self-efficacy and approaches to studying, Prat-Sala and Redford (2010) found that motivation orientation and approaches to studying are correlated; self-efficacy was also correlated to approaches to studying. Self-efficacy is described as self-belief in their ability to perform a task, as opposed to actual efficacy, or competence to perform the task. Their findings imply that motivational orientation and self-efficacy are connected since both are connected to approaches to studying. Indeed, intrinsic motivation tended to lead to taking a deep or strategic approach to learning, whilst extrinsic motivation was linked with surface learning. High self-efficacy was found to link to deep-learning strategies and low-self-efficacy to surface learning.

I touched on deep and surface learning in section 3.2 (pages 21-22) in terms of students' perceptions of assessment. Tasks perceived as unfair tend to lead to surface learning, whilst those perceived as relevant lead to deeper learning. It now seems to me that in any future work I do I could start by identifying behaviours linked with approaches to studying, since self-perception and approaches to studying are linked with locus of control. Linking back to my earlier questions about fairness (section 3.2, pages 21-22), I am now questioning whether people who appear to be extrinsically motivated are more likely to view a task as unfair, versus those who appear to be intrinsically motivated.

Ryan and Deci (2000) see intrinsic motivation tendencies as an innate human characteristic. However, the individual must find the task intrinsically interesting in order to be intrinsically motivated. It is important to stress that intrinsic motivation is seen by Ryan and Deci (2000) as the motivation arising from the task itself, hence the task is performed for its own sake. Extrinsic motivation, by contrast, is the motivation required to perform a task for some purpose separate from the task, such as in order to pass an examination or to please a parent. Ryan and Deci's (2000) work shows that when intrinsic motivation is present it can be sustained in social contexts, which allow the individual a sense of competence, autonomy and relatedness. I understand relatedness to mean a supportive social environment. According to Ryan and Deci (2000) autonomy is about making your own choices, not about individualism, so is not antagonistic to the idea of relatedness. In fact, they quote work that demonstrates that teenagers with a high level of relatedness to their parents behave more autonomously.

Ryan and Deci (2000) describe how strong parental bonds have been shown to increase children's curiosity and exploration for children working on intrinsically interesting tasks. Although it is not necessary to have others nearby in order to work happily on an interesting task, a child can lose motivation if adults around them are cold, uncaring, or ignore them.

Nowicki (2016) reinforces this view, saying internality develops when children are in a safe, nurturing environment, where they can explore and, as a result, develop awareness of what they can control and what they cannot. Externality develops in an over-protective environment, which restricts their exploration, hence restricting their experiences of what they can and cannot control. Flouri (2006) showed that children's locus of control aged 10, predicted their academic achievement aged 26. Moreover, Nowicki (2016) says that although internality leads to doing better in one's chosen field, it is also important to recognise what you cannot control so that you do not try to exercise control inappropriately, quoting the serenity prayer from Alcoholics Anonymous, "God grant me the serenity to accept the things I cannot change, courage to change the things I can, and the wisdom to know the difference" (p. 212).

So far I have reported some views on mindsets, locus of control and motivation using the authors' terms. Now, I will reflect on their observations and interpretations and attempt to explain their views of internal and external in my terms.

Altogether many terms and concepts have been mentioned above. Many are opposites of each other, others are found to correlate with each other in various pairings leading to a strong sense of an underlying pattern. To summarise, high self-perception of competence and self-belief of efficacy are linked with internal locus of control, intrinsic motivation and deep learning, whilst low self-perception of competence and self-belief of efficacy are linked with external locus of control extrinsic motivation and surface learning.

Before going any further I will gather together many of the terms used above in a table below under the headings internal and external.

Term/concept	**Internal**	**External**
Mindset (Dweck, 2017)	Growth Can improve Take ownership Learn from failure Accurate self-assessment	Fixed Cannot become better Outcome important Blame others for failure Less accurate self-assessment
Locus of control (Joelson, 2017)	Internal Own their success/failure More likely to learn Believe their efforts matter Better jobs Parents encourage independence Sentences begin with “I”	External Attribute failure to the environment More anxious Not in control of what happens to them Less good jobs Use of passive voice
Motivation (Harter & Jackson, 1992)	Intrinsic High self-perception of confidence	Extrinsic Low self-perception of confidence
Motivational orientation (Prat-Sala & Redford, 2010)	Intrinsic High self-efficacy Deep, or strategic, learning strategies	Extrinsic Low self-efficacy Surface learning
Section 3.2 (pages 21-22)	Tasks perceived as relevant Deeper learning	Tasks perceived as unfair Surface learning
Motivation (Ryan & Deci, 2000)	Intrinsic Task must be intrinsically motivating Sense of competence Autonomy – making own choices Relatedness e.g. strong parental bonds	Extrinsic Task performed for a separate purpose Controlled
Nowicki (2016)	Internality Safe, nurturing environment Free to explore More sense of what can be controlled Does better in chosen field	Externality Over-protective environment Restricted exploration Less sense of what can be controlled Does less well in chosen field

Table 17: Summary of terms used and correlations found.

Table 17 highlights that there is indeed an underlying pattern, with the same ideas arising from different sources being repeated in the same column, such as “better jobs”, or “does better in chosen field”, occurring in the internal side of the table, reinforcing my view that despite not agreeing with the labels internal and external, they hold some meaning for me.

In my opinion, Ryan and Deci (2000) are looking at motivation in a different way to Dweck (2017), or Joelson (2017) who seem to see fixed/growth or internal/external as characteristics of the individual. Instead Ryan and Deci (2000) appear to see fixed/growth or internal/external as descriptions of behaviours that can be observed as a result of the events that occur, which brought to my attention that Joelson (2017) also describes a behaviour he uses to identify an “internal”, i.e. starting sentences with “I”, or an “external”, i.e. using the passive voice.

Both Harter and Jackson (2992) and Ryan and Deci (2000) describe how Individuals can change between internal and external over time or have different levels of internality/externality in different school subjects, for example. Thus my issue, at the moment, is with the use of the words as a label of the individual, rather than the words themselves.

As with the ant and the human, an observation is of that moment and could be different at a different time. Therefore these words can only be used as labels temporarily. In other words the person in not permanently internal, but is behaving in a way that can be labelled as internal at that moment, in the sense given above. The words internality and externality can be taken as behaving in an internal way or an external way. Moreover, does it make sense to use these labels at all?

Consider a rider putting a head collar on a horse. (Let’s call it Lief.). The rider leads Lief to the water trough. Lief refuses to drink. The rider leads Lief to the tack room, Lief pushes the rider out of the way and nudges the door open. How would I describe the Lief’s locus of control? At each stage Lief is making his own decision, to take the head collar, not to drink, to open the door. Thus it could be said that, in the terminology used above, he has an internal locus of control in each case.

Lief could choose not to submit to the head collar if he wishes, if the task he thinks he is about to do is not attuned with his own wishes. The rider might then chose to take various actions. They could force the collar onto his head; they could give up completely and chose a different horse; they could punish Lief for his refusal. Moreover, what if Lief has been beaten previously for not submitting to the head collar? I could argue that the rider forcing on the head collar is an external factor over which Lief has no control. He submits because of the wishes of another i.e. he is accepting the head collar for a purpose other than the task in hand of going for a ride, so this could be labelled as an external locus of control.

In both cases, however, Lief is making the choice to submit to the head collar, in the first case to achieve something in tune with his own wishes and in the second to avoid something absolutely not in tune with his own wishes. In both cases Leif is making his own decision based on his own previous experience and the current situation. It could be said that in both cases he is exercising an internal locus of control. Applying the words internal and external to the motivation to act, is proving less than useful, as it is always Lief who chooses how to respond.

Perhaps this is easier to think about using the example, given previously, of a bacteria moving towards sugar (section 8.4.4, page 105). They move towards food sources and away from harmful chemicals (Teitzel, 2015). In both cases the bacteria is moving of its own volition, either to gain something positive or to avoid something negative. So both could, perhaps, be considered as internal. However, someone could come along with a big cloth and wipe up the bacteria along with the harmful chemical just sprayed on the worktop and wash it away down the sink, something over which the bacteria cannot avoid, which could be considered external.

In figure 2 (page 166), Simmt and Kieren (2015) use the words self and other to show an interaction between two entities. Applied to the horse example, Lief, as self, views the head collar as being put onto it by an other. Leif then acts as he wishes according his own choice in response to the head collar. The bacteria, as self, moves to sugar/from chemicals, and is wiped up by an other with a cloth. This leads me to argue now, that locus of control is neither internal nor external. Rather it is about having the power to act, in the sense described by Davis and Sumara (2006) of "capacity to act" (p. 122).

Reid and Mgombelo (2015) say

> "changes in the environment might perturb the system, triggering changes in the system's structure. Things get interesting when there are recurrent patterns of triggering and being triggered that result in structures that allow these patterns to persist" (pp. 174-175).

In my opinion, Ryan and Deci (2000) are be describing just such patterns of behaviour that have formed over time as Lief or the bacteria respond to similar events.

I, therefore, consider that both internal and external locus of control, as described in the texts above, can be considered as the capacity to act only, i.e. there is no internal nor external aspect to the decision being made. In line with the meanings ascribed by Ryan and Deci (2000), I would further argue that when action is taken for a reason perceived by the individual to be within their capacity to act, and in keeping with the individuals' own aims, that is an intrinsic motivation. Whilst an extrinsic motivation might mean that the individual's perception is that they has less, or no, capacity

to act and therefore comply with the task on some level; or that the task is not in tune with the aims of the individual but is undertaken to avoid a negative consequence.

12.5 How do people motivate themselves?

I will address the nature of a motivation scale in more detail in section 12.5.1, below. As above, I will report on authors' findings using their terms (pages 175-177), before reflecting on them, and interpreting them in my terms (pages 177-179).

12.5.1 Motivation scales

Nowicki (2016) sees motivation on a scale, as do Ryan and Deci (2000). The difference between them is that Nowicki (2016) uses a measure from 0 to 40, whilst Ryan and Deci (2000) use a descriptive scale called the *self-determination continuum* (see table 18, below), with amotivation, or a failure to be motivated and "lacking the intention to act" (Ryan & Deci, 2000, p.72), at the opposite end to intrinsic motivation. Here, extrinsic motivation sits between the two extremes, with a high level of external control of the individual at one end and a high level of personal choice and autonomy at the other. Note, that by autonomy, Ryan and Deci mean "an internal perceived locus of causality" (deCharms, 1968 cited in Ryan & Deci, 2000, p. 70), rather than the autonomous self of enactivism. In other words the individual believes they have the capacity to act, as opposed to the enactivist view of an autonomous individual having the capacity to act.

Behaviour	Nonself-Determined					Self-Determined
Motivation	Amotivation	Extrinsic Motivation				Intrinsic Motivation
Regulatory Style	Non-Regulation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	Intrinsic Regulation
Perceived Locus of Causality	Impersonal	External	Somewhat External	Somewhat Internal	Internal	Internal
Relevant Regulatory Processes	Nonintentional, Nonvaluing, Incompetence, Lack of Control	Compliance, External Rewards and Punishments	Self-Control, Ego-Involvement, Internal Rewards and Punishments	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis With Self	Interest, Enjoyment, Inherent satisfaction

Table 18: The self-determination continuum showing types of regulatory styles, loci of causality and corresponding processes (Ryan & Deci, 2000, p. 72).

Perceived locus of causality is what I previously called locus of control which I am now taking as the individual's self-belief in their capacity to act. Rather than there simply being an 'internal' or an 'external' locus of causality, Ryan and Deci (2000) show a continuum between two extremes. They introduce the idea of regulatory styles, or how control (of their own actions by the individual) is manifested, and can be observed, in performing the task, which vary depending on the level of interest and autonomy of the individual.

The two extremes are the easiest to understand. Doing a task by choice (self-determined, autonomously, i.e. owning the capacity to act, and for its own sake (intrinsic motivation) is described as intrinsic regulation. It can be seen as a positive choice of the individual. At the other end, doing an imposed task (nonself-determined, impersonal) in which one has no interest at all (amotivation), simply going through the motions, is described as non-regulation, i.e. not avoiding a task completely but not engaging with the task in any way.

Extrinsic motivation sits in between and is split into 4 regulatory styles, described below.

Integrated regulation

In many respects integrated regulation and intrinsic regulation could be seen as identical. In both, the individual acts through their own choice to achieve the outcome (of the task). The difference is that for intrinsic regulation satisfaction arises from the task itself, whilst for integrated regulation the task is performed willingly to achieve some other separate outcome, such as pass an exam, rather than for the pleasure of the task itself. The task and the desired outcome are seen by the individual as in some way synonymous.

Identified regulation

In identified regulation the individual recognises and values the outcome (rather than the task), taking ownership of their need to achieve that outcome, but performing the task purely in order to achieve the outcome. In other words, the task is seen as somehow separate from the outcome. Ryan and Deci (2000) point out that some studies have combined the two categories of integrated and identified regulation into one of autonomous regulation.

Introjected regulation

Here, although the individual is choosing to perform the task in order to achieve the outcome, they do not take ownership of the outcome. Hence, it is still perceived as an external stimulus. Ryan and Deci (2000) describe this as "regulation by contingent self-esteem" (p. 72). This could be trying to achieve a high grade to demonstrate ability or working to avoid failure.

External regulation

Ryan and Deci (2000) say that external regulation occurs when an individual is controlled in some form with no choice, perhaps through rewards and punishments. Ryan and Deci (2000) link this with Skinnerian operant behaviour, i.e. a learnt behaviour based on past experiences.

Drawing on their own work and that of others, Ryan and Deci (2000) report links between introjected regulation, feelings of anxiety and difficulty in dealing with failure; and between external regulation, less effort and blaming others for failure. They point out that some studies combine introjected regulation and external regulation into one category of being controlled.

The four regulatory categories, above, sound more useful than two (autonomous and controlled) since they allow for a more nuanced interpretation.

Whilst it is not necessary to pass through each stage of the model (Table 18, page 175), people can change their regulatory style. Ryan and Deci (2000) present evidence with support for relatedness, competence, and autonomy being important for an individual to move towards intrinsic regulation over time.

Having reported some views on motivation using the authors' terms, I will now reflect on Ryan and Deci's (2000) self-determination continuum and re-describe it in my terms.

Previously, I saw intrinsic and extrinsic motivations as polar opposites closely linked with the individual's internal or external locus of control. But now, having re-evaluated locus of control to mean that the individual has the capacity to act, I no longer need the adjectives internal and external

in this context. Instead, how the individual chooses to act varies is a result of their own perception of locus of causality, with regulatory style being a label than can be applied to a set of observed behaviours fitting to the regulatory processes.

Ryan and Deci (2000) are using autonomous and controlled as opposites of each other. In my opinion, in both cases the individual has the capacity to act. The difference is the individual's perception of their own capacity to act. If they perceive themselves as being able to make their own decisions they are acting in an autonomous manner. If they believe they are not able to make their own decisions they are behaving in a controlled manner. In this context, instead of autonomous I would prefer to say that the individual is acting in a way which is aligned with their own purposes; and instead of controlled they are acting in a way that does not aligned with their own purposes.

Below I will redraw table 18 relabelling some of the boxes in the light of my arguments above.

Behaviour	Nonself-Determined	Self-Determined (Power to act)					
Motivation	none	Amotivation	Extrinsic Motivation				Intrinsic Motivation
Regulatory Style	none	Non-Regulation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	Intrinsic Regulation
Perceived locus of causality	other	Impersonal or extremely unaligned with self	Unaligned with self	Somewhat unaligned with self	Somewhat aligned with self	Aligned with self	Aligned with self
Relevant Regulatory Processes	none	Nonintentional Nonvaluing, Incompetence, Lack of Control	Compliance, Rewards and Punishments	Self-Control, Ego-Involvement Rewards and Punishments	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis With Self	Interest, Enjoyment, Inherent, satisfaction
Examples of possible observation	University closes due to a pandemic so there are no more maths classes to attend.	Sits in maths lessons doing nothing. Never does homework.	Homework done poorly, not finished. Excuses given for incomplete work.	Turns immediately to grade or score. Does not read feedback.	Leaves maths homework, to the last minute.	Engages enthusiastically in maths lessons. Applies to study a science subject at university.	Stays up till midnight to complete a maths investigation Applies to study maths at university.

Table 19: Amended self-determination continuum based on table 18 (Ryan & Deci, 2000, p. 72).

Notes on the table as amended.

1) Behaviour: All behaviour is self-determined, except for situations such as the bacteria being wiped up by a cloth. I have added an extra column for nonself-determined behaviour of this nature.

2) Motivation: Intrinsic motivation relates to doing the task for its own sake; extrinsic motivation to doing the task for some other purpose e.g. to pass an exam. I have not yet decided if amotivation is separate or if it is simply an extreme version of extrinsic motivation, hence it remains for the time being.
3) Regulatory style: is a label to summarise an observed pattern of behaviour. I have kept the original labels with the proviso that the word external is taken to mean situations where the individual's perception is that they have no, or very little, choice over how to behave.
4) Perceived locus of causality: is about how the individual views the amount of freedom they have to act as they wish. Instead of internal and external, I have changed the description to being more or less aligned with self.
   Regarding the word control: acting as they wish, aligned with self, the individual is likely to feel in control of their own actions, whilst acting in a way less aligned with their own wishes they are likely to feel less in control of their own action.
5) Relevant regulatory processes: describes factors that may be observed relating to how the individual choose to behave.
6) Examples of what might be observed.

When analysing and reflecting on ethical behaviour (chapter 7, pages 89-96) my awareness was raised of what it means to behave ethically. I believe this has enabled me to respond more consistently and appropriately to ethical issues, in the moment, as they arise. Similarly, I anticipate that using Ryan and Deci's (2000) self-determination continuum as amended above, will, help me to identify behaviours, as they occur, that require different responses. However, as it stands the table does not offer any help on what those different responses should be for helping individual amend patterns of behaviour.

From section 12.4 above (pages 168-175), it is clear that people who take ownership of their decisions and of their success or failure are more likely to achieve more favourable outcomes. It is also clear that individuals can change their motivational orientation. In particular, Ryan and Deci (2000) consider intrinsic motivation to be innate to humans and therefore, in their opinion, it important not to study intrinsic motivation itself, but rather what causes intrinsic motivation to decrease, as well as how individuals motivate themselves to perform tasks that they do not find intrinsically motivating.

12.6 How can intrinsic motivation decrease?

Deci, Koestner and Ryan (2001) reported on extrinsic rewards and internal, or intrinsic, motivation. Deci et al. (2001) propose that intrinsic motivation is based on an individual's need to become competent whilst feeling in control of their own actions, i.e. they perceive themselves as having the capacity to act.

In my opinion, extrinsic rewards are offered in order to motivate and are a diversion away from the task itself, although dependence on extrinsic factors could possibly mean something more than or different to rewards. For instance, correct answers and marks (section 4.3.7, pages 41-42) are not necessarily a reward, but could be seen as such.

In their literature review on extrinsic and intrinsic rewards, Deci et al. (2001) split extrinsic rewards into tangible and verbal rewards. They show that the use of expected tangible rewards, such as chocolate, gold stars etc., can and do undermine, or even destroy, intrinsic motivation. When rewards are unexpected, they do not affect intrinsic motivation.

12.6.1 Tangible rewards

Based on what is expected of the individual to earn the reward, Deci et al. (2001) categorise extrinsic tangible rewards, into three subheadings, "task-noncontingent"; "task-contingent"; and "performance-contingent". Task-contingent can be sub-divided into "engagement-contingent" and "completion-contingent". As an example, they suggest that rewards for taking part as a subject in an experiment would be task-noncontingent as it does not involve competence or, in their terms, self-determination. Task-contingent rewards can be given for completing the task, or for simply engaging with it, both of which can be devoid of attaining any level of competence. Performance-contingent rewards are given for a specific achievement, such as, getting a certain grade or being better than others. There is, therefore, a sense of a level of competence involved. Yet this category was shown to be the most likely to degrade intrinsic motivation.

Deci et al. (2001) also split rewards and other extrinsic factors into two types in a different way, "informational" and "controlling". Extrinsic factors can be many more things than simply rewards such as deadlines, evaluations, department or government set targets and so on, all of which occur in an educational setting; and could include the classroom

environment and the learners' peers. Although their paper is focussed on rewards, Deci et al.'s (2001) acknowledgement of the wider setting is useful.

By "informational", Deci et al. (2001) mean extrinsic factors that aid competence and self-determination. Correct answers could conceivably fall into this category since knowing that the answers are correct could give the individual a sense of competence, allowing them to choose what path to follow next.

According to Deci et al. (2001), it is the "controlling" aspect of rewards that reduces intrinsic motivation. However, all categories of tangible reward include some level of attempted control of the learner because the reward is given for certain behaviours that the reward giver wants to see. As a result, the learner may be coerced into behaving in a way they may not wish to do, or to engage with the task differently in order to gain the reward instead of the task outcome per se.

12.6.2 Verbal rewards

Deci et al. (2001) show that positive feedback, which they call verbal rewards, can help intrinsic motivation. However, the expectation of verbal rewards can lead to learner behaviours that are focussed on gaining verbal rewards, when the verbal reward is used in a "controlling" manner.

Based on their meta-analysis of more than 500 studies from a range of different paradigms, Hattie and Timperley (2007) observed a pattern of different types of feedback. They report that feedback involving praise, rewards or punishment are the most detrimental to learning. Information relating to the task and how to improve performance were the most beneficial.

12.7 How can intrinsic motivation increase?

According to Harter and Jackson (1992) changes in self-perception are linked with changes in motivational orientation, in other words it is possible to become more intrinsically motivated as well as less.

If internality (perceived capacity to act) is important to succeed, then it must be important that teachers seek to increase intrinsic motivation in their students. From section 12.6 above, it would

seem sensible to avoid the use of "controlling" rewards of any sort, especially expected tangible rewards, which decrease intrinsic motivation, particularly for performance-contingent purposes.

Deci et al. (2001) suggest that rather than focus on giving rewards, it would be better to focus on increasing intrinsic motivation by making tasks more interesting, providing more choice of activity, and ensuring the challenge level of the task is optimal. I would add to this that we should also focus on ensuring that verbal rewards are also used to try and increase not only competence, but-self-efficacy and also the individual's perception of their own capacity to act.

The use of verbal rewards links back to my pilot study (section 4.3.7, pages 41-42) which showed that over the length of the course students moved away from relying on teachers and correct answers to reliance on feedback on what was done well, and the next steps to take for improvement. Next I will consider what aspects of verbal rewards are linked with an increase in intrinsic motivation.

12.7.1 Verbal rewards: Praise

According to Hattie and Timperley (2007), feedback involving praise very often fails to aid enhanced learning. However, there are different types of praise. Mueller and Dweck (1998) studied the difference between being praised for intelligence or praised for working hard, which could both be seen as positive feedback.

Following praise for either intelligence or hard-work, Mueller and Dweck (1998) offered learners the choice of problems allowing performance goals, e.g. a higher grade, or learning goals, e.g. deeper understanding or new strategies. Those praised for hard work were more likely to choose tasks that enabled them to learn. Moreover, learners praised for intelligence showed more interest in seeing how others were doing than in learning new strategies to solve problems, even when they could improve their performance through new strategies. Furthermore, following failure, those previously praised for hard work tended to attribute their failure to not trying hard enough, whilst those praised for intelligence tended to attribute their failure to low ability. In other words, those praised for intelligence appeared to equate ability (Mueller and Dweck's word) with performance, whilst those praised for effort did not. Mueller and Dweck (1998) also observed that intrinsic motivation dropped for the intelligence-praised individuals following a failure, whilst for the effort-praised individuals it did not. Therefore, if using praise, it should be for effort not intelligence.

12.7.2 Verbal rewards: Feedback

Thinking about feedback previously (section 10.4, pages 124-125), I described how we used a feedback system on the MEC which aimed to help students move towards a goal by reporting to them what they had done well and what they need to do to improve. A model that is re-inforced by Hattie and Timperley's (2007) meta-analysis of many studies. In summary they conclude that answering three questions, which can be categorised as Feed Up, Feed Back and Feed Forward, can be helpful to students to increase their effort, motivation and engagement. i.e.

Where am I going? (the goals)	Feed Up
How am I going?	Feed Back
Where to next?	Feed Forward

Table 20: Feedback answers three questions (Hattie & Timperley, 2007, p. 87).

Moreover, they propose that each of the three questions can be addressed on four levels, task, process, self-regulation and self, at which feedback operates. I will describe the four levels in more detail below.

Task

Feedback at the task level (FT) is about whether answers are correct or incorrect, or perhaps about the need for more, or more relevant, information to be included. It could be for aspects such as neatness.

Hattie and Timperley (2007) report that FT is most effective when it relates to misconceptions, rather than lack of knowledge. Lack of knowledge should be addressed by (re)teaching.

The main problem with FT is that the feedback is specific to the task and is not generally transferable. It is often related to surface learning but is a powerful tool if used well (Hattie & Timperley, 2007).

Process

Feedback at process level (FP) could be about the strategies used to solve the problem, or how to present the work to enable the reader to better understand it, for example.

FP is most effective when it helps students to behave in a strategic manner, perhaps by using suggested strategies, or self-checking to identify and reject incorrect or inefficient approaches and searching for better approaches.

FP can lead to deeper learning than FT and is more likely to be transferable to other tasks than FT. FP linked with FT can be an effective way to build confidence at the surface level, enabling the learner to move onto deeper learning. (Hattie & Timperley, 2007).

Self-regulation

Feedback on self-regulation (FR) is about encouraging the student to become more independent, for example, a reminder about what they know and how they use their knowledge to self-check their work. Effort feedback (as described by Mueller & Dweck, 1998) comes into this category, particularly early on in the learning process.

Self

Feedback at the self-level (FS) is directed at the individual. Hattie and Timperley (2007) give examples such as "you are a great student" and "that's an intelligent response, well done." (p. 90). There is no mention of the task.

In my opinion, I have already shown feedback at the self-level (FS) is ineffective. It falls in line with the arguments about praise above (section 12.7.1, page 182; Mueller & Dweck, 1998). Indeed, Hattie and Timperley (2007) go on to explain that FS is the least effective of the four levels, for similar reasons. However, they point out that students (mostly) like to be praised, and so praise should not necessarily be discarded altogether.

On its own, FS pays attention to the person not the task, but can be linked with one of the other forms of feedback, such as "you are a great student, because you listened to advice…."; "…. on how the technique works and you got everything correct this time"; or "…. and lined up your working making it easy to follow your logic". In other words when it is addressing the actions taken by the student. However, even used in this manner, care must be taken in the use of FS because students can position themselves as wanting to be seen as a good or bad student, ignoring the useful part of the feedback. Indeed, as reported by Hattie and Timperley (2007), Kruger and Nisi (1998) found that in terms of achievement, no praise at all has more effect than some praise, which, although not quite the same, reminds

me of Black and Wiliam (1998), who reported that written comments are more effective on their own than if given alongside grades.

Hattie and Thompson (2007) report that the levels of feedback in most classrooms is low, with the most common forms being FS and FT, despite students being most likely to change their behaviour in response to FP and FR.

The amended self-determination continuum (table 19, page 178) was previously identified as a helpful aid in identifying student behaviours that may need different responses, but without identifying how to respond. I would argue that it is difficult to advise how to respond as a general principle because every response to a learner is dependent on the exact circumstances at that time. However, the model of four feedback levels, above, is helpful as an aid to focus on how to shape a response to aid learning.

I believe the MEC had a good feedback system, having already incorporated the ideas of feed up, feed back and feed forward, and I know from my pilot studies that MEC students moved towards use of feedback (section 4.3.7, page 41-42). I believe that we were using the full range of feedback level i.e. FP and FR as well as FT and FS. However, I am now wondering just how good that feedback was, and if we did use the full range of feedback levels.

It would be useful to analyse, as a future project, the assessment feedback forms for the three aspects of feedback (feed up, feed back and feed forward) as well as the four levels discussed above to see in what ways feedback has been used by the tutors and whether the regime could be improved.

12.8 Feedback from student to tutor

Feedback from the tutor to the student is considered in section 12.7.2 (pages 183-185). MEC feedback forms also had a box for the student to reply to the tutor's comment. It reminded me that at the end of each unit of work throughout the course, the students completed course evaluation forms on each unit of work as it was completed, and also one for the whole course at the very end of the course.

Grimes, Millea and Woodruff (2004) consider this type of feedback in their paper on economics, student evaluation of teaching (SET) and locus of control (perceived locus of causality). Using Rotter's (1966) scale to measure locus of control, they found a relationship linking locus of control

and SET. Those with an external (sic.) locus of control were more likely to award lower scores to their teachers than those with an internal (sic.) locus of control.

According to Grimes et al. (2004), locus of control is somewhat innate, but also linked with personal experiences. They believe that a reliable way has yet to be discovered to change locus of control (perceived locus of causality), but suggest that giving the individual knowledge of their self-perception may help to focus on what needs to change.

Grimes et al. (2004) also suggest using well-structured group work, where groups are selected with knowledge of the students' locus of control (perceived locus of causality). Grimes et al. (2004) go on to say that extrinsically motivated students are less likely to engage in group work, and the group work needs to ensure that all take part and take control. This is an interesting idea. The MEC, at least in my sessions, was organised with group work at its core. How I interacted with the groups was based on one aspect of complex instruction (Boaler, 2006). I paid attention to the group working as one, the idea being that everyone in the group has responsibility to each other to ensure that the whole group achieve the task. Those that understand and can proceed easily have a responsibility to ensure that others can too. Those that do not understand have a responsibility to the group to ask for help. When the group says the task is finished, there is an assumption that everyone in the group has engaged and can explain the group's solution. Therefore, I could pick anyone within the group to answer on behalf of that group. If they could not do so, the group would have to work more until they could.

By using the amended self-determination continuum (table 19, page 178) combined with the ideas of Grimes et al. (2004) it may be possible to form groups based on observed behaviours.

12.9 Changing motivational attitudes

In their review of motivation in mathematics, Middleton and Spanias (1999) drew five conclusions:

1	“Students perceptions of success in mathematics are highly influential in forming their motivational attitudes” (p. 79)
2	“Motivations towards mathematics are developed early, are highly stable over time, and are influenced greatly by teacher actions and attitudes.” (p. 80)
3	“Providing opportunities for students to develop intrinsic motivation in mathematics is generally superior to providing extrinsic incentives for achievement” (p. 81)
4	“Inequalities exist in ways in which some groups of students in mathematics have been taught to view mathematics” (p. 81)
5	“Achievement motivation in mathematics, though stable, can be affected through careful instructional design.” (p. 82)

Table: 21 Summary of Middleton and Spanias’ (1999) conclusions.

Point 1 reinforces the view of Ryan and Deci (2000) and Harter and Jackson (1992) that self-perception of competence and motivational attitude are linked. Point 3 backs up the idea that tasks should be designed to increase intrinsic motivation.

Points 2, 4 and 5 add an extra dimension. Middleton and Spanias (1999) say that motivational attitudes develop early and are stable over time but can be affected by well-designed teaching. There is an implication that it is not necessarily easy to change an individual’s motivational orientation. Also, it may be harder to do with some individuals than others due to differences in how they have been taught to view mathematics. Nowicki (2016) gives examples such as children attending summer camp who have a short-term change towards internality (perceived capacity to act) whilst on the camp, only for it to drop back again when they return to their normal environment. Hence, it seems that, in order to make long-term changes to motivational orientation, it is necessary to be immersed in such a programme for a longer period of time.

12.10 Conclusion

Internal and external are not useful in describing motivation since the actions of an individual are always self-determined. Each individual has the capacity to act, i.e. to make their own choices about how to respond to events. However, how they chose to act depends on their self-perception of whether they have the capacity to act, which in turn is determined by their past experiences and current situation.

Ryan and Deci's (2000) self-determination continuum summarises a range motivational orientations and behaviour patterns that could be observed. In this chapter I have created an amended version replacing the idea of internal/external perceived locus of causality with the perception of capacity to act, as described in section 12.5.1 (pages 175-179).

Those people who are intrinsically motivated are more likely to be successful, over the long-term, at whatever they have chosen to do than those who are extrinsically motivated. Motivational orientation appears to be formed early and remains stable over time, but can be changed by appropriate teaching and feedback, although this needs to be applied consistently over time.

One way of affecting motivational orientation is through well-directed feedback. Hattie and Timperley's (2007) model of types of feedback, described above (section 12.7.2, pages 183-185), is a useful aid in ensuring that feedback is appropriately targeted to aid learning.

In the next chapter, I will review my interpretation of Keziah's and Leone's narratives using the amended self-determination continuum (table 19, page 178). Since the reflective logs could also be considered as feedback from students to tutors I will also, briefly, trial an analysis of reflective logs using Hattie and Timperley's (2007) feedback model to see if it could give a second viewpoint for interpreting the logs.

Chapter 13: Answering questions?

In this chapter, I return to my interpretation of Keziah's and Leone's narratives (chapter 11, pages 129-164) to consider my research question "how do students' perceptions of assessment change over the course?" (section 9.3, pages 114-116).

In order to know if, and how, students' perceptions change, I would need to have some indication of what students' perceptions were at the outset; and possibly what had influenced them to hold this view; as well as some understanding of their perceptions as the course ended; and hopefully of what influenced any changes. I do not think I can answer these questions in their original form; the issues raised through engaging with their data (chapter 11, pages 129-164) were broader than assessment. However, I believe I can use the idea of motivational orientation and the self-determination continuum (chapter 12, pages 165-188) as a way of describing how I see the students behaving through my analysis and interpretation of their data sources, and hence draw conclusions, to some extent, on their perceptions more generally. I will also trial analysing the reflective logs using Hattie and Timperley's (2007) feedback levels to identify if this can give an alternative way of viewing their narratives to confirm or contrast with the conclusions I draw from using the self-determination continuum.

My two participants certainly appear initially (section 11.6, pages 163-164) to be intrinsically motivated (Keziah) and extrinsically motivated (Leone). However, the literature, explored in chapter 12 (pages 165-188), has shown that motivational orientation is not bipolar, i.e. either intrinsic or extrinsic, but a continuum between two extremes which can be considered through the lens of Ryan and Deci's (2000) self-determination continuum, as amended in chapter 12 (table 19, page 178). I will consider more closely where Keziah and Leone lie on that continuum, as well as their perceptions more widely. I will also return to the issue of feedback because moving towards reliance on feedback to gauge their own sense of attainment was the biggest change identified in my pilot studies. Before doing so, I will consider how I will make use of the amended self-determination continuum (table 19, page 178), included again here for convenience.

Behaviour	Nonself-Determined	Self-Determined (Power to act)					
Motivation	none	Amotivation	Extrinsic Motivation				Intrinsic Motivation
Regulatory Style	none	Non-Regulation	External Regulation	Introjected Regulation	Identified Regulation	Integrated Regulation	Intrinsic Regulation
Perceived locus of causality	other	Impersonal or extremely unaligned with self	Unaligned with self	Somewhat Unaligned with self	Somewhat aligned with self	Aligned with self	Aligned with self
Relevant Regulatory Processes	none	Nonintentional Nonvaluing, Incompetence, Lack of Control	Compliance, Rewards and Punishments	Self-Control, Ego-Involvement Rewards and Punishments	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis With Self	Interest, Enjoyment, Inherent Satisfaction
Examples of possible observation	University closes due to a pandemic so there are no more maths classes to attend.	Sits in maths lessons doing nothing. Never does homework.	Homework done poorly, not finished. Excuses given for incomplete work.	Turns immediately to grade or score. Does not read feedback.	Leaves maths homework, to the last minute.	Engages enthusiastically in maths lessons. Applies to study a science subject at university.	Stays up till midnight to complete a maths investigation Applies to study maths at university.

Table 19 (copy): Amended self-determination continuum based on table 18 (Ryan & Deci, 2000, p. 72)

13.1 Using the amended self-determination continuum

In line with section 12.3 (page 167), the documents I refer to (chapter 11, pages 129-164) were written by Keziah and Leone at a given point in time. Their writing is from their viewpoint at that in time, and in response to the circumstances at that time. I am looking at their behaviour (as they write about it) across the duration of the MEC. I observe patterns in their behaviour. The patterns that I find are my interpretation of their description at a given time. Someone else may view them differently, indeed I may view them differently at a different time.

When writing I may conflate the actions observed, the perceived locus of causality, regulatory style and motivation behind them. I will use my dogs as an example of why.

Observed behaviour: The lurcher is dancing from foot to foot by the front door. The terrier is running back and forth between the front door, the utility room and the cloakroom. They do this every afternoon if they see one of us go near our shoes or their leads.

Our response: “Oh look, the dogs want to go for a walk”.

If we leave the leads on the ground they may pick them up and bring to us. Whether they bring them to us or not, they let us clip the leads to their collars; another signal to us that they want to go on a walk.

In other words our description of what is observed is to ascribe a motivation and alignment with the dogs' wishes to the dogs' actions. We interpret the dancing and the running as signs that the dogs enjoy walking. Their regulatory process is enjoyment, walking is their choice. With reference to the amended self-determination continuum (table 19, page 178), I can therefore say that they are behaving with intrinsic regulation and are intrinsically motivated. To put it another way their perception of causality and motivation is seen through their actions, and our description does not distinguish between perception, motivation and action. Just like the expert described by Gladwell (2006) who had a bodily reaction of revulsion to a fake statue when they saw it (section 8.4.4, page 113), so the dogs have a bodily reaction to the signals that a walk is imminent. We in turn respond to the dogs actions and so on.

Another example: the terrier shakes his head back and forth when we try to put his muzzle on. We say "He doesn't like the muzzle". The dog reacts to the muzzle. He doesn't stop and think and then decide how to act. His immediate response and his motivation are so closely linked that they are essentially the same thing. However, without the muzzle we will not take him out, so he keeps coming back and looking at the muzzle. His response to the muzzle is the same each time we try to put it on, until we slip a dog treat into the muzzle. Now he responds to the treat, putting his head in straightaway to get the reward, trying immediately to pull his head back out before the clip is closed. Now, with reference to the amended self-determination continuum (table 19, page 178), I would describe the regulatory process as rewards and compliance. Fletcher's behaviour shows the act of putting on a muzzle to be unaligned with his wishes in that moment. His regulatory style is therefore external, and he is acting with extrinsic motivation.

I open the door. It's raining. Fletcher turns around and comes back in. Now we say "oh the Fletcher doesn't want to get wet". In other words the dog's perception of rain is not aligned with his wishes and the motivation we assign to the action we see is a different one to that which we assigned only a moment before. But it is contingent on the circumstances at that moment.

It seems to me that the dogs' actions are operating on several different levels. A walk may take 30 minutes, or hour or more. Putting on a muzzle takes seconds. It is one action out of many involved in going for a walk, but it is possible for Fletcher to be extrinsically motivated by the muzzle, at the same time as being intrinsically motivated by the walk.

With regards to levels, Davis and Sumara (2006) propose that an idea can be studied and understood at different levels such as the behaviour of an individual, a class, a whole school and so on, with each level being embedded within the larger level. They point out that individuals can change their behaviour quickly, but larger structures such as a school or university are slower to change, whilst changes in the behaviour of society as a whole takes even longer.

Within a stable societal system there can be volatile and changeable behaviour at the individual level. For example, observing individual dogs, mine demonstrate liking walking differently by dancing or running. That the terrier tries to run back indoors if it is raining rather than go for a walk does not alter the longstanding and stable observation that dogs (as a species) like walks, but in that moment for Fletcher, dislike of rain outweighs liking walking. Once he has been dragged out, liking walking reasserts itself as he pulls along the road after a cat!

According to Davis and Sumara (2006) there is a link between the size of system being studied and the time taken for changes in the behaviour patterns of that system to change and evolve, i.e. a longer time is needed to change a larger structure. For example, MEC courses were introduced at a national level to address a problem. It took several years to develop the idea, trial it and roll it out nationally. It took several more years before the national expectations were changed and a wider range of provider were allowed to deliver MEC courses. The MEC I ran changed a little each year as a result of reviewing the previous year, perhaps adjusting an assessment task or the amount of time allocated to different strands of the course, or a tutor was replaced by a different one and so on. On a week by week basis I might have to change the order sessions are taught in. Within a taught session I might take a different route through the ideas introduced due to questions from students. Neither of which alters the overall course.

Davis and Sumara (2006) say it is important to understand that all the nested levels are operating at the same time and that it can be difficult to define exactly where a boundary between levels occurs. However, the idea in question can be studied by jumping between levels. I could, if I wished, study all students of mathematics; all university students; British society as a whole and so on. Each group is nested in the next larger group. Also, the students encounter tasks that last different amounts of time and are nested within each other. Just as putting a muzzle on is part of going for a walk, so doing a worksheet could be part of learning about differentiation which in its turn is part of the larger topic of calculus and so on. Calculus is one topic out of several that make up the MEC. Whist the MEC itself can be considered one step out of a series of steps to become a mathematics teacher. The student is experiencing all of these nested levels concurrently and at any given moment, the student may be responding to any those levels.

As stated in section 12.5.1 (pages 175-179), and illustrated above in the dog examples above, I will be describing Keziah and Leone using regulatory style as a label of a set of observed behaviours which fit the regulatory processes. The motivations and assigned descriptions may be different a moment before or a moment after, i.e. it is the repeating pattern of turning back in that enables me to say that Fletcher doesn't want to get wet. When I say "Keziah is …" or "Leone is…" it should be read below in the manner of as a result of observing a repeating pattern of behaviour.

13.2 Current perceptions

13.2.1 Keziah

As I read and reported on Keziah's documents (chapter 11, pages 129-164), I felt a strong sense throughout of Keziah not just engaging with the task in hand, but having a relationship with the mathematics. She shows a high level of personal choice, for example in the way she chose to put some distance between herself and the rest of the group in the face of negativity (section 11.3.3.1, page 153). From this point of view, referring to the amended version of Ryan and Deci's (2000) self-determination model (table 19, page 178), Keziah was working with intrinsic regulation; she engages with mathematics for its own sake, showing interest, enjoyment and inherent satisfaction. Successful completion of the MEC, through demonstrating a certain level of mathematical competence, was a pre-requisite of entry to a PGCE; i.e. a purpose other than the task itself. However, Keziah almost seems to have forgotten that she is being assessed (section 11.3.4.1, pages 155-158), engaging with the mathematics for its own sake. Hence, from this point of view, I would categorise Keziah as working with integrated regulation. She is not undertaking the MEC as an imposition on her, but is showing congruence with its aims.

Reflection on the self-determination continuum: I previously said that the full range of descriptors was more nuanced and therefore more useful than combining into pairs as "controlling" or "autonomous" (section 12.5.1, pages 175-179). I am now finding that I want to combine intrinsic regulation and integrated regulation in order to describe Keziah, but thinking that perhaps I do not need to. Perhaps it is useful here to think at the course level and the task level. Keziah is working with integrated regulation at the course level, but intrinsic regulation at the task level, i.e. one stage more intrinsic at the task level than the course level.

13.2.2 Leone

Reading Leone's documents (chapter 11, pages 129-164), I felt that Leone is clearly motivated to learn for purposes of her own but she is not motivated by the mathematics itself. She is consciously aware of the need to succeed on the MEC course in order to progress to become a teacher. She wants to be a teacher; not a mathematics teacher. Hence, in Ryan and Deci's (2000) terms, neither the course nor the mathematics is intrinsically motivating for Leone, so she must be operating with some level of extrinsic motivation. She is studying mathematics as a means to an end, not for its own sake. In my opinion, this means that she cannot be operating with integrated regulation either, as that requires congruence with the aims. She does, however, value the outcome of successful completion of the MEC as this will allow her to become a teacher. From this point of view she is working with identified regulation (table 19, page 178).

Leone demonstrates a high level of reliance on textbooks and passing exams (chapter 11, pages 129-164). Her awareness of assessment remains high throughout the MEC. Her focus is on passing or failing, rather than on using assessment tasks as vehicles to learn. Leone works hard but appears to believe that she remains poor at mathematics (low self-efficacy), despite her effort and the fact that her assessed work shows a high level of competence (efficacy). She appears to choose surface learning approaches such as answering sets of similar questions in a textbook. Leone chooses extrinsic measures, such as examination results, to know how well she is doing. Hence, appears to be working on the mathematics mainly with introjected regulation (table 19, page 178).

Reflection: I have placed Leone fairly centrally on the self-determination scale. Leone is working with identified regulation at the course level, but introjected regulation at the task level, i.e. one stage more extrinsic at the task level than the course level.

In terms of the course level, Keziah and Leone are fairly close together. Keziah wants to be a mathematics teacher, understanding that doing mathematics is integral to her future role and is therefore in tune with the course. Leone, by contrast, wants to be a teacher, mathematics is simply a vehicle to take her there. It is, therefore, important to her to achieve a successful outcome, but that is all; she has not integrated the course aims as her own.

In terms of the task level, Keziah and Leone diverge further, with Keziah finding tasks intrinsically motivating, whilst for Leone extrinsic measures such as marks are important. She barely seems to consider the task itself.

I conjecture that course-level motivation could well have an effect on task-level engagement. Although I cannot generalise from two individuals, it strikes me that Keziah is able to work more intrinsically at the task level than the course level, whilst Leone is working more extrinsically at the task level than the course level. I am wondering if a similar pattern between task and course level would occur if I were able to look at more people.

13.3 How did their perceptions arise?

13.3.1 Keziah

Keziah has had at least one teacher in the past (section 11.2.1.2, page 133) who may have helped her develop self-reliance. Although, overall, there is not enough evidence to draw conclusions on what influences affected Keziah's motivations prior to the MEC, her view of teachers had changed at some point. Keziah talked about the teachers respecting her at school and how she would disengage if they did not. On the MEC she described how the teachers taught (section 11.2.1.2, page 133). Since she is reflecting on the nature of teaching on the MEC in week 1 and a specific teacher in week 2 (section 11.3.1.1, pages 140-144), I do not think this change was due to the MEC, but had occurred prior to starting the MEC. Her focus had moved from the effect of teachers on her personally to their effect on her learning. Maybe Keziah's feedback on her teachers could be described using Hattie and Timperley's (2007) feedback levels (section 12.7.2, pages 183-185). Her initial comments about respect could be at self-level, whilst her comments on the MEC about how the teachers teach could be at process level. Her positive evaluation of the MEC tutors is also indicative that Keziah perceives her aims to be aligned with the MEC, since according to Grimes et al. (2004) (section 12.8, pages 185-186), people who are intrinsically motivated are more likely to assess their teachers positively.

13.3.2 Leone

In her end-of-course interview Leone described some of her experiences of learning mathematics prior to the MEC. It is clear that she believed then, and from her logs still does

at the end of the MEC, that she is no good at mathematics (section 11.2.2.1, pages 136-137; section 11.6.2, page 163). Leone's view of herself as weak at mathematics appears to have been formed very early. She describes herself as no good at mathematics on moving back to the UK at the age of eight. Looking at her log (section 11.2.2.1, pages 136-137), it is not possible to tell whether she had already formed this view or formed it on returning. The school starting age is at least one year later in the US than the UK, meaning that the children in her UK class had studied mathematics for at least a year longer than Leone. Thus, it is possible that her return to the UK was instrumental in forming her view.

With both Keziah and Leone, there is insufficient depth available to be able to say for sure how they formed their perceptions prior to the MEC. There are clues that could possibly be picked up in another interview in the future.

13.4 How have their perceptions changed?

13.4.1 Keziah

I do not have evidence to say that Keziah's perceptions of assessment have changed. Keziah was intrinsically motivated from the start of the MEC. Perhaps if I had used Rotter's questionnaires (1966) and overlaid that numerical scale onto Ryan and Deci's (2000) self-determination continuum, I might have been able to see a change in Keziah's level of intrinsic regulation, an idea that I could follow up on in the future. However, she is intrinsically motivated, taking control of her own learning throughout the MEC; I would anticipate that any change identified would have been small.

Keziah has, however, become aware that not everyone shares her positive attitude to learning, talking about the negativity of others. She describes how some of the others were purposefully criticising tutors (section 11.2.1.1, page 132), which could indicate that the critical individuals are extrinsically motivated, as according to Grimes et al. (2004) they are more likely to rate teachers lower than those who are intrinsically motivated. Moreover, according to Ryan and Deci (2000), those who demonstrate introjected regulation (extrinsic motivation) are more likely to blame others for their failures. I believe Keziah is seeing a mismatch between her own intrinsic motivation and the extrinsic motivation of others.

13.4.2 Leone

Leone began and ended the MEC by believing she was not good at mathematics and by comparing herself to others (section 11.2.2.1, pages 136-137; section 11.3.1.2, pages 144-148). Thinking about motivational attitudes, as described by Middleton and Spanias (1999), Leone has possibly been influenced by past teachers (point 2, table 21, point 2, page 187) and has been taught to view mathematics in a particular way (points 1 & 4). Her beliefs on the nature of mathematics learning appear to be stable (point 5), proving largely unaffected by our teaching, despite the MEC being set up to develop self-reliance (point 3) and lasting six months. Leone does not appear to have changed her motivational orientation throughout the six months.

Reflection: Neither Leone nor Keziah appears to have changed their motivational orientation much from their starting point. Leone appears to have had a strongly held belief in her lack of mathematical ability by the age of eight, Middleton and Spanias (1999) say that motivational orientation develops early which is perhaps why it is hard for Leone to change now. By contrast, Keziah started the MEC with a high level of intrinsic motivational orientation. Ryan and Deci (2000) believe that intrinsic motivation is innate to humans but can be diminished if not nurtured in a supportive environment. Keziah says there were no critical incidents in her mathematical learning journey, so I am surmising that nothing occurred to make her lose intrinsic motivation.

13.5 Looking back to Lila's Log

Re-reading my interpretation of Lila's Log (chapter 5, pages 49-72), I noticed similarities between Lila's Log and Keziah's, and possibly between Lila's student B, Leone and other unnamed students referred to by Keziah.

In section extract 3 (section 5.4.1, pages 54-56), Lila describes feeling negative towards some other students, whom she describes as demanding and "wrapped up in their own world". Lila shows empathy in her concern about the effect they have on other course members, as well as on herself. She refers to student B who cheated in class (extract 11, section 5.4.5, pages 61-62). This, linked with some cheating that had affected her on her OU course, formed a series of critical events for Lila.

This is in some way parallel to Keziah's awareness of negativity in her end-of-course interview.

The other parallel I would like to draw out is about fairness. Lila had a sense of fairness and justice, centred around the idea of cheating both within the MEC and on her OU course. I would now ascribe her sense of fairness to be that everyone should play by the same rules. In Lila's case this meant not cheating, so that the effort people put into an assessment would be reflected in however their attainment was reported back to them. Keziah (section 11.3.1.1, pages 140-144) also mentions fairness. When some people were absent for a day and the tutor adjusted what was taught, Keziah felt the actions of the absentees had caused her day (and that of the other attendees) to be less worthwhile than it would otherwise have been. She felt as though she was being punished on some level for their non-attendance. Fairness was linked with how her efforts to ensure she attended were (not) rewarded versus how the lack of efforts of the absentees was not punished.

Reflection on negativity: I did not notice negativity as an issue when I was working on Lila's Log, Keziah's Log gave me that awareness. I would now link negativity to motivational orientation, using either Rotter's (1966) questionnaire or Ryan and Deci's (2000) self-determination continuum, or both overlaid on each other as suggested above (section 13.3.1, page 195).

Reflection on fairness: Fairness was raised by Geraldine (section 1.1, page 7; section 2.3, pages 12-16), which led me to debate what she meant by fairness (section 2.3.1, pages 15-16). Awareness of fairness for Geraldine, Lila and Keziah arose from different stimuli, but in each case it is possible to see a series of small-n narratives (Tannen, 2008) as each tells their story, which becomes a Big-N Narrative as the series of small-n narratives become linked together, giving a Master Narrative of fairness or justice as an umbrella notion for all three.

Reflection on negativity and fairness combined: On some level, negativity is also linked with fairness. This view is backed up by Ryan and Deci (2000) where some extrinsically motivated individuals are motivated to achieve a high grade for self-esteem (section 12.5, 175-179). For Lila, the people she perceived as behaving negatively wanted to be seen to have a high score, even if it meant cheating i.e. not doing the right thing, not playing by the rules, not caring how their actions affect other people. For Keziah, these people were more likely to be critical of the tutors, disrupt her learning and not play by the rules. All of this puts motivational orientation at the centre of it all.

13.6 Feedback again

Having considered rewards, including feedback, in chapter 12 (pages 165-188), and in particular the four levels of feedback; task, process, self-regulation, self, described by Hattie and Timperley (2007) (section 12.7.2, pages 183-185), I proposed that the tutor feedback to the students could be analysed using these four levels. This would enable me to see how effective our feedback was, and to plan improved feedback. This analysis would necessarily need to be a future project, as it would be taking me down a new route. Moreover, I also suggested (section 12.10, pages 187-188) that the four levels could be used, in reverse so to speak, to analyse the students' logs, and indeed the students' evaluations of tutors. My hope is that this would give me a second method of viewing their logs. I will take an initial look at this idea here to see if it has potential for the future. Hence, as a trial, I will return to one log entry, the same week, for each of Keziah and Leone. I am thinking that a way forward in working with students could be to look at their logs in this light and then be able to offer them feedback on how to use their logs to help themselves move towards deeper learning.

I consider week 1 log entries for Keziah (table 3, page 119) and Leone (table 4, page 120).

This is a first pass through the data, where I have put the statements into the level that feels right to me as I read. If I were to use this technique to fully analyse the whole log, or on a week-by-week basis throughout the course, I would need to be more rigorous and set myself guidelines to ensure consistency.

13.6.1 Keziah – week 1

Level	Day	Text
Task	Tuesday	I need to go away and brush up on a lot of these simple concepts.
	Friday	I felt really pleased, throughout the day I grasped all the concepts given and remembered how algebra worked and how rewarding it is. The main errors I made was with missing out minus signs, which as I know can make your work very wrong.
Process	Wednesday	I approached it logically and clearly, it allowed me to clearly see where the patterns were, and to solve it affectively. we could all see patterns going on but verbalising and expressing them was difficult This way of teaching is not something I am used to, however I have found it very effective, as we had to test our brain and really think about what we were doing to come up with a solution, and when we found the solution the method and what we did was a lot more memorable This shows that I should always think about my work more and not assume things.
	Thursday	Working together with all members of this class has been really good, it has showed me how different people approach problems and that there are many solutions to a problem. Something that I need to work on is putting what I mean into words that can describe it clearly to others. she explained everything clearly and made us feel comfortable about asking questions no matter how silly they might be
	Friday	This is something I used to do back at school and I must make sure I pay a high attention to detail. Working in groups is really helping me as it's giving me a lot of help and ideas that I probably wouldn't come up with on my own.
Self-regulation	Monday	By the end of the course my aim is to be able to teach up to A-Level, a lot of hard work is going to be needed.
Self	Monday	I felt excited to start as I really want to get back into maths, and I feel nervous as to whether my previous ability will come back at first, I felt I was out of my depth, after we got our brains going the maths started coming back and it was good fun.

Table 22: Feedback level applied to Keziah's week 1 log.

Keziah appears to be commenting on her engagement with the course largely at the process level. Her comments at self level are positive, and perhaps relate to self-regulation.

13.6.2 Leone – week 1

Level	Day	Text
Task	Tuesday	I found the work we did on prime numbers really interesting as I have previously not really known what use they are, just knew that they existed! I find 'out of the box' thinking quite difficult as I was taught by rote whilst at school, but understand why it is important to practice. Whilst I found the activities fairly mind-bending, on reflection I can see how useful it is to have this knowledge at your fingertips and how key it is for teaching. Enquire at local schools regarding AS- Level entry. I enjoyed working out that it was all based on powers of 2, and liked the fact that we came to a clear conclusion and proof of our conjecture.
	Wednesday	I was pleased this morning to know that others had used similar techniques, and this gave me confidence in my abilities. It was great to be able to follow the relatively simple proof of why the problem couldn't be solved after Alison's 'light bulb' moment!
	Thursday	I found the work we did involving Pascal's triangle particularly interesting today, as I didn't realise in how many things it can be involved. I'm starting to see how properties of number are everywhere and I'm finding it fascinating!
	Friday	Complete exercise 1B on writing equations in C1/C2 book Complete exercise 1C on changing the subject of an equation in C1/C2 book.
Process	Monday	Make sure to contribute fully during group work. Devise an efficient filing system to keep work organised.
Self-regulation	Monday	I want to be much more confident in my abilities
Self	Monday	I am worried as I'm the only person in the group who hasn't done A Level before- I'm so worried about being left behind! I didn't contribute as much as I would have liked as I was lacking in confidence a little. Getting overwhelmed, especially during C3/C4 content. Getting back on track and not becoming stressed if I feel that I am falling behind others.
	Friday	I am glad to have found out that I am weak in the areas of writing equations from information given and in changing the subject of an equation. These area weaknesses that I have found hinder me when studying maths to a higher level and it's good to get the chance to work on it now at the start of the course.

Table 23: Feedback level applied to Leone's week 1 log.

I found it harder to categorise Leone's statements than Keziah's, because I feel that each of Leone's contains a mixed message. For example, the statement from Friday which I have put into the self level could be a statement at the task level of a need to work on changing the subject of a formula. However, in my opinion, saying "I am weak in" is a statement about self, which feels stronger than the reference to the algebra itself.

> What I see is many more task level and self level statements than process or self-regulatory statements.

This simple analysis backs up the view I had formed from considering regulatory styles, that Keziah and Leone's approaches to studying are different. Keziah's focus is on the process, hence more likely to lead to deep learning; whilst Leone's focus is on self and task which is more likely to lead to surface learning (Hattie & Timperley, 2007).

13.7 What next?

It seems to me, the idea of fairness is underlying everything I am writing about. For example, returning to the question of who is most likely to identify a task as unfair. I would conjecture that the most likely to complain is someone with an introjected or external regulation style, since they have a tendency to blame other factors for their failures. Going forward I could, perhaps, use Rotter's (1966) locus of control questionnaire, linked with Ryan and Deci's (2000) self-determination continuum, as suggested above (section 13.3.1, page 195), to identify where individuals' behaviour lies on a combined scale.

Returning to one of my initial aims, which was about improving the assessment regime so that assessment tasks appear fair, it may be that I need to look at this differently. The idea of fairness seems to arise from several different directions. In some sense, it comes from comparison with others. By this I do not mean in terms of grades, but in terms of playing by the rules, as a sense of injustice when A has behaved in the culturally expected way and B has not but has got away with it, or even been rewarded. Equally, it could be arising from a mismatch in expectations of the students and tutors such as the equity and equality approach described in (section 2.3.1, pages 15-16). It could then be that, rather than think about perception of fairness as a unitary identity, a level of perception of unfairness could (should) be expected. Overall, perhaps the issue of fairness is a red herring. Instead of trying to improve the assessment regime, or maybe alongside trying to improve the assessment regime, it would be more fruitful to identify where on the scale between amotivation and intrinsic motivation each person sits and work on ways of making them aware that they could change their regulatory style away from external and towards intrinsic.

13.8 Conclusion

In this chapter I have drawn together the ideas that have emerged, as I have moved forwards through the research process, relating to my question “how do students’ perceptions of assessment change over the course?” I believe I have found a way to progress this investigation, as described in section 13.7 above.

In the next chapter, I will review the overall research process, and my journey through it.

Chapter 14: Conclusion: Journey's end and new beginnings

In chapters 1 to 13 I have told the story of my research journey. This is the end, but it is not the end. I have raised far more questions and possibilities than I have answered or addressed in the last thirteen chapters, hence there is much more still to be done.

In this chapter, I will reflect on what has gone before, and look forward to what could come next. I consider this chapter as a staging post. It is another opportunity, as in chapters 6 (pages 73-88) and 9 (pages 111-116), to reflect, take stock, and consider my options before deciding on the way forward.

14.1 Looking back to changes …

14.1.1 … affecting my motivation

When I started this research project, investigating students' perception of assessment, nine years ago, my circumstances were different to what they are today. Yet, when I reached the point that I am calling the end, I found that the theme of students' perceptions of assessment was as strong as it had been at the outset. In other words, there are differences and there are similarities to where I started. At this juncture, I think it would be useful to reflect on some of the things that have changed or stayed the same.

At the outset, I was investigating a question that would feed back into the MEC course. I had responsibility for designing and implementing the assessment regime in use. I thought that I could investigate students' perceptions of assessment and, as a result, amend the assessment regime to make it be perceived as fairer. I hoped this would encourage higher levels of student engagement with the tasks, and hence for the students to more fully demonstrate their achievements (section 1.1, pages 5-7; section 3.3.3, pages 26-28). I am now in a different job where I do not have responsibility for the assessment regime. My original reasons for undertaking this study no longer exist. I had not questioned my motivation before changing jobs. I have documented the decisions I made about how to progress throughout this thesis, but not my motivation and emotional engagement with my project. It may be worthwhile to consider my motivations in the light of my reading (chapter 12, pages 165-188) on motivation; in particular regulatory style from the self-determination continuum (Ryan & Deci, 2000).

I was brought up to believe in the adage, “If at first you don’t succeed, try, try again”. In other words, effort is important for success, or in Dweck’s (2017) terms, a growth mindset. I work hard, believing that I can always learn more through my own efforts. In this context, the question for me now is, “What is success?” Changing jobs, I found myself with a dilemma. I did not know if I wanted the PhD because it was in some way useful to myself and others, or simply for the challenge of learning more. For example, in one of the induction sessions for this PhD we had to answer the question of, “What is the role of the PhD supervisor?” I said it is to help me to achieve what I want to achieve. The implication is that I was there for my own learning, which in itself ignores the requirement of a PhD programme. What I wanted could have been totally at odds with the programme aims. Indeed, I can get annoyed when people try to impose their requirements on me. This conflict can be seen at times in my writing. I did not want to get into a “philosophical box” (chapter 6.1.5, pages 78-79). I saw ethics as being somehow imposed on me (section 7.2.1, pages 92-93). Yet, despite this, I read and discovered that neither a philosophical stance nor an ethical stance was an imposition on me. Rather, I found that I needed both in order to complete this work. Referring to Ryan and Deci’s (2000) self-determination continuum, it would appear that, as I read and became more aware of what it meant to have my own philosophical and ethical standpoints and of their importance, I began by *compliance* (external regulation) and moved through *conscious valuing* (identified regulation) to *synthesis with self* (integrated regulation). I believe I moved beyond integrated regulation to intrinsic regulation, because once I had that awareness I began to enjoy the challenge, examining different perspectives and comparing with my own, taking satisfaction in my achievement in its own right. As a novice researcher, I needed some level of impetus from an other pointing me in the right direction, enabling me to move towards becoming an expert. Had my supervisor purely helped me to do what I wanted, I may not have read in enough depth and my thesis would now be lacking in many areas. So, it would appear that my learning process contains a move from an external to an internal perceived locus of causality. I am not sure of the starting point; starting with compliance may be a little harsh on myself. Maybe I was already at a stage of conscious valuing in that I understood that I needed to comply?

Changing jobs had a dramatic effect on my motivation, to the extent where I would categorise myself as being in a state of amotivation for a while. My work could not feed back into the MEC so what was the point in continuing? I questioned if I should just stop and cut my losses. However, that is not an entirely negative point of view. I knew I had learnt a lot and was satisfied with what I had learnt. I saw, and still do in some respects, gaining a

qualification as unnecessary. If I am satisfied with my learning, do I need others to confirm it? Yet, as described above, I did not know what I did not know about philosophical and ethical standpoints. I am ignoring the fact that a qualification demonstrates to society that I have the necessary expertise to undertake certain roles. No-one would allow me to drive a car without passing a driving test. But I do not have to like driving lessons to pass. I could gain that qualification whether I was externally regulated or intrinsically regulated. I guess it is just easier to do and more enjoyable if one is intrinsically motivated.

In summary, my perceived locus of causality and hence regulatory style has not been static. They have fluctuated between both extremes of internality and externality and everywhere in between. It would, therefore, be unreasonable to assume that my students have a fixed regulatory style. I concluded (section 13.2, pages 193-195) that it is possible to have two different regulatory styles concurrently at different levels e.g. task level and course level. Now I must add that, in-line with Maheux and Proulx (2015) who say that enactivist research should focus in the moment, whatever I observe is a snapshot at that point in time and should not be assumed to be static.

14.1.2 … affecting my choices

In chapter 9 (pages 111-116) and section 14.1.1 (above), I described how changes to my work environment affected me, influencing the way forward. In making those changes, I believed that I was changing what I was investigating. I followed paths that arose, or I could say emerged. I was surprised, when I found that the new paths I had followed, such as locus of control (chapters 12 &13, pages 165-203) linked back to earlier questions. But reflecting now, I am surprised that I was surprised. Changes in my world affected how I engaged with the world, but, in making sense of my new situation, I adapted new information, applying back to my own interests. It is hard, or perhaps impossible, to see any boundary. My choices were, and are, embedded in the situation I am in. I believe that what I am describing is the same as Simmt and Kieren (2015) mean when they say “knowing is doing is living is being” (p. 311), which is an enactivist stance.

14.1.3 … affecting the outcomes

Although I had no intention of writing a paper that looked like a traditional research paper (section 1.2 pages 7-8), I did anticipate that I would start by looking at students’ perceptions

of assessment and end by raising some insights into how students perceive assessment, as well as some questions to be followed up in further studies. I believe I have done this. In chapter 13 (pages 189-203), I summarised my findings, following one strand of thought, and made suggestions for a way forward. There were other questions and other possible ways forward that had occurred to me throughout this journey; I return to these briefly below (section 14.3, pages 213-216).

As I wrote, I became more aware that the question of students' perceptions was overlaid by my voice describing my journey through the research process, which I return to in section 14.2 below. I was not actively aware of how strongly my own voice featured until I had to make choices about how to continue. Reading my own writing; reviewing what I had done so far; looking for how to proceed when I thought the way forward had become blocked off, I came to realise that I was not just telling the story of how I dealt with my research questions, rather, I was telling my own story laying bare the twists and turns that occurred as circumstances impinged on me; making decisions about how to react. I believe I have gone beyond the story I anticipated telling (section 1.2, pages 7-8) and have created something more powerful, showing the events that occurred and how they are dealt with. I do not believe these decisions should be hidden behind the façade of a text that says, here is my question; here is what I did; here are the results; and this is what I will do next, as if I knew that is what I would do from the beginning. Hence, this thesis is now clearly operating on two levels, that of the students' perception and that of my research journey. I consider both to be equal, but relevant to different groups of people (section 14.5, pages 218-219).

14.2 Looking back to the narrative of my research journey

I had previously addressed voice (section 5.6.2, page 69) and time (section 5.6.3, pages 69-71) as part of narrative. Now, rereading my writing several times thinking about, not only voice and time but, what other themes occur in my own narrative, I identified that the idea of levels, introduced in section 13.1 (pages 190-193) had been present throughout my work. I will consider time, levels and voice separately below.

14.2.1 Time

At the outset I was unaware that time would be such a big issue. I became aware as I struggled to present my work over time due to re-engaging with what had gone before at different times (section 5.6.3, pages 69-71). I drew on the work of Baynham (2003) and Brockmeier (2000) to clarify what time meant to me.

I was reminded of this when someone, I have forgotten who, on Radio 4 recently talked about time in two ways. One was the passing of time as a human construct that we can measure in seconds, minutes, hours, … . The other was time as a sequence of events where the amount of measured time doesn't matter. For example Janet and John got married after our holiday in Spain. The order matters but the two events could be a day apart, a week, a year, i.e. the ideas of time proposed by Baynham (2003). I also encountered time in two different ways, but not exactly these two.

Firstly, I had a sense of time-pressure: time passing and a necessary end date getting closer. Time-pressure arose from human measurement of time, with the objective time measured by the clock leading to a subjective sense of time passing too quickly (section 5.6.3). This is reflected in my writing at times when I say "I did not have time to ….", for example, arrange interviews before the course started (section 4.3.4.1, page 38); analyse circle time recordings (section 4.3.2, page 41)); or, take a new approach entailing changing to a longitudinal study (section 9.3, page 115). Time-pressure also meant it was necessary to be aware of the need to keep a focussed central thread moving forward. I could only allow myself to explore issues that arose for a limited time to see if there were any ideas that linked to my central thread. For example, I did not follow up the ideas of equivalence of MEC participants to mathematics graduates (section 2.1, page 9) or face-to-face teaching versus online (section2.1, page 10), as they are not directly relevant to perceptions of assessment.

The second way I encountered time was as a slippery concept that I could not tie down as I tried to keep to my central thread. How could I accurately write when my awareness of what I am writing about is different each time I re-encounter that idea? I began writing with the idea that I would start at the beginning and then describe each step as it occurred; the decisions I took as a result in order to move to the next step and so on. In other words I was attempting to write my story using time linearly, as a time sequence but not in terms of measured time. It was only as I came to reread now that I realised the difficulty is probably, that whilst it may be possible to present events in order, it is not possible to present my thoughts linearly.

Throughout writing, I struggled with how to present my thinking which was bound up in the original thoughts, tempered and changed by everything I had encountered and experienced since. This is essentially a cyclic process, returning to the starting point with new awareness. This proved to be one of the hardest parts of writing. It is hard now to explain why it was hard then, but I have just used the structure that occurred to me to overcome the issue, i.e. then and now. Using then and now allowed me to create my own narrative time (Brockmeier, 2000) by leaving what I had thought at some point in the past alongside what I thought as I reread my own work. Both are necessary if I am telling my own journey because it shows how I have changed over that time interval (section 5.6.3 pages 69-72).

Yet it was only through trying to write a linear sequence of events that I came to realise that I was writing my own story, which I will return to below.

The other difficulty with trying to order of events is that an event might be only thinking, not linked to any physical actions. How can I say this thought occurred before this one, when they are interlinked? For example, it took me a long time to decide the order of chapter 7 on ethics and chapter 8 on enactivism. The development of my thoughts on both ethics and enactivism happened over time alongside doing everything else. My interactions with Teresa, which crystallised some thoughts on ethics, occurred after I had written the original design and before changing jobs, i.e. it definitely belonged between chapters 6 and 9. But what of enactivism? Nothing had occurred that made my thoughts on enactivism really crystallise, yet I had to include a description of my thinking somewhere. Looking back now, the problem is that I was still thinking. When I am embedded in thinking, ideas pile on ideas, forming an interrelated jumble. I know there is sense in there, but as yet cannot put it into words. It was only in doing the data analysis that I was able to unjumble the thoughts, i.e. another cycle was needed. The evidence of which can be seen in chapter 12 (pages 165-188) where I needed to expand more on what I meant by being enactivist.

In other words, everything is unfinished and there is no such thing as enough time, just returning to that same point with new awareness over time.

14.2.2 Levels

Based on the work of Davis and Sumara (2006), I talked about students working on many levels concurrently (section 13.1, pages 190-193). This felt like a new idea enabling me to identify that the students' motivations could be different at different level, e.g. task level

and course level, concurrently. Yet as I reread my work I found that I had encountered models based on the idea of levels previously. Summarised below:

Where	Who	What	Lower level		Higher level
Section 6.1.2, page 76	This thesis	Context	Single student	My MEC	MECs nationally
Section 4.5, page 45	Starman (2013)	Case study	Single case	Cohort as a whole	
Section 5.2.1, page 50	Chase (2005)	Narrative	One incident	One phase of their life	Their whole life
Section 5.4.5, pages 61-62	Tannen (2008)	Narrative	Small-n narrative	Big-N narrative	Master narrative
Section 6.1.8.1, page 84	Attride-Stirling (2001)	Thematic analysis	One theme	Organising theme	Global theme
Section 8.4.4, page 106	Damasio (2000)	Levels of knowing	Metabolic responses to the environment	Automatic or reflex actions	Feeling
Section 8.6, page 110	Simmt and Kieren (2015)	Enactivist research	Observer	Relationship between knower and the world	Ethics and the ethical implications of working in an enactivist realm.

Table 24: Examples of levels encountered in this thesis

Having collated this table, I find two things interesting. Firstly there are nearly always three levels suggested. I have not investigated why three. However, I do know that if writing persuasively it is recommended to use three points. For example, political slogans often use three words, e.g. the Blair government's "Education, education, education" (1997), or three ideas as in the UK Government's slogan during the COVID-19 outbreak "Stay at home; Protect the NHS; Save Lives" (2020). And I have now remembered that one of my assessment tasks described in section 2.3 (pages 12-15) split the group into three levels. This idea of three levels is a point to note and is not directly relevant to anything I am reporting. However there must be something about human thinking where three is in some way optimal, and I would like to know more about why.

Secondly the idea of levels was prevalent in my work from the outset, yet I was not aware of this until I had explicitly used a model of levels i.e. task level and course level to describe Keziah's and Leone's motivations. It is only with reviewing my own work that I became aware. In a way I think this is due to levels of thinking. I was thinking at a detailed level of

the individual participants as I wrote, but at an overview level of the whole thesis when I reread my writing.

I find it satisfying that what I am applying to the participants applies to me too.

14.2.3 Voice

Returning to the idea of writing my own story: through trying to describe a linear sequence of events, I became aware that I was telling my story as I progressed through the thesis. As I reread and reflected on my writing, I found that I was more sure of where I stood on ideas later on than I had been at the beginning. In other words my understanding of the world had become broader and deeper, but more than that I would not have been aware of that depth and breadth without rereading my work. Rereading made me aware that I was learning over time. I cannot say at what point learning happened. It is more a sense of becoming aware over time that this was useful for me. One of the things I am saying is, I am a PhD researcher and this is how it happened for me. It may be useful for others to see that the journey through the PhD was not a neatly packaged story that can be foretold at the outset.

It was only as I read my own writing that I became aware of how strong my voice was in the writing, and that I had a choice. I could allow my voice to stay or I could tone it down, or try to remove it. However, by allowing my voice to show through I am allowing the reader to see who I am. This is turn allows the reader to make their own judgement on the interpretations I have made and any conclusions I have drawn. To illustrate this point, I frequently start sentences with “I think…” (pages 15, 46, 53, 55, 66, 69, 71, 79, 146) or “I feel… “ (pages 1, 2, 10, 36, 47, 56, 63, 67, 77, 84, 117, 144, 164, 201), both of which draw the reader’s attention towards me as the writer. In my opinion I am using “I feel …” in reflective situations, e.g. “I feel that as a result of the act of *doing* research, I was learning about *how* to do the research” (page 47). The comment is about an effect of what I was doing on me. Whilst I am using “I think …” to describe something more factual, e.g. “I think the closest I can get to describing the fragmentary model is as a series of standalone moments” (page 71). This is about something I am doing and my effect on that, rather than its effect on me.

As with time, I struggled with ideas around voice as I was writing. I am aware that I am using several different voices as I write. In section 5.6.2 (page 69) I reported that I have a storytelling voice, a factual voice, a reflective voice and a researcher’s voice. It is not always clear which voice I am using at any given time. At one point I considered identifying my

different voices by using a different colour or font to show the reader which voice I am using. I have not done this, and looking back I do not think it would be easy to do, unless I use a whole colour palette as the voices overlap.

Early on, before I knew about narrative (section 4.2, page 34), I identified how I viewed assessment differently in three different ways concurrently, i.e. as a teacher, learner or a parent. I would now have to add in a fourth way, which is as a researcher. In this thesis I am speaking primarily as a researcher, whilst working as a teacher in the environment I am researching. The experiences I have had myself as a learner will have influenced and informed my views as teacher and as a parent, and all three as a researcher. Equally, my experiences as researcher must influence my views as teacher, parent or learner. In other words the voices overlap because they influence each other. In my opinion, this alone is a good enough reason not to try and tone down or remove my voice. Whilst I think I am writing as a researcher, the reader may detect different nuances in how I present my work at different times that I am not aware of. I would want them to see this in the same way that I have looked at Keziah and Leone's narratives as existing on different concurrent levels.

I think/feel/in my opinion that it is important that the reader can read make their own interpretation about who I am and how I do my research.

14.3 Looking back to consider…

14.3.1 … limitations of this study

The cohort size on each MEC is quite small and variable; in the last cohort there were only two participants. It is not possible to make generalisations from two participants. With a larger number it would, perhaps, be possible to see patterns emerging across groups of people. However, with a smaller number it is possible to perform deeper analysis than would be possible with a larger group. I believe I have done this and have also been able to see links that could be the beginning of a larger pattern.

The participants are my own students. This means that there is always a relationship, which will colour what the participants give and how I interpret that. I have been clear throughout that interpretations are mine. Despite this, it would be useful to have more than one person's take on the narratives. In a previous research project, undertaken with a colleague (Stansfield & Vaughan, 2013), we recorded a lesson I taught. We each listened to the

recording separately, noting the time when we thought something interesting was occurring. We found that we had both identified the same incidents from the lesson, but I was consistently marking the time where my interest began slightly earlier than my colleague. This time discrepancy led to a fruitful discussion of why these points were of interest to both of us and why was it that, for one of us, the spark of interest happened just after the other, causing both of us to see the data in a new light. Another observer might be useful in this current project too for the same reason.

Time passing meant that the opportunity was lost for interviewing the participants at key points in their career progression. Hence, I did not undertake my proposed comparison of how perceptions of assessment change as one progresses through stages of development as a teacher. Whether I should consider this as a limitation is a moot point because I have made progress in other directions.

14.3.2 … the strengths of this study

In a way the strengths also lie in those aspects I have identified as limitations.

The small cohort size forced me to analyse texts in more depth than I might otherwise have done. The data I collected meant I was able to draw on what I needed as I needed it. Researching my own students meant I did have a relationship with them, which makes it easier to set up and carry out interviews, since we are in the same place and are used to talking to each other.

Another way of gaining a second perspective, might be to interrogate data from students on a MEC at another university. However, when considering this I would be missing the context. I would not have the insight into how and why the course and its assessment tasks were as they were, with the risk that I might misinterpret information by assuming thing were like my MEC. Hence, I believe that researching my own MEC has led to a consistency that is a strength of this research.

Flexibility has also proved to be a strength of this project. I have allowed things to happen rather than forced things to happen. I found as I was writing that I was not longer merely working on students' perceptions of assessment, but was also describing a meta-level of my own journey through the research process, which I now think is of equal importance to the original aims.

As well as being a problem, the long elapsed time taken to reach this point has proved beneficial. It has allowed time for me to develop ideas and return to data, seeing it from a different place and time, allowing new interpretations. In other words, time has allowed me to, some extent, become my own second observer.

I also believe that my use of literature is a particular strength of this thesis. When reading other people's work there is usually a literature review near the beginning of the work, with a sense of the reading having been done and therefore fixed. I used literature throughout my work, allowing me access to new ideas throughout. By continuing to read, I am linking into the ideas of circular and spiral time (Brockmeier, 2000). Instead of simply circling back to the same idea in the same form, I can return to the same idea, arriving at the layer above rather like layers in a slinky, for example face validity (section 14.3.1. below).

14.3.3 … my contribution to knowing

Another strength of this project, I believe, is that I have combined ideas and methods in new ways. There are two main areas where I have combined models for analysis in new ways.

14.3.3.1 Warp and weft

In my original design (section 6.1, page 73-88), I planned to analyse cohort data using thematic analysis (warp) and individual data using narrative analysis (weft). The idea behind this is that the threads in the warp and weft directions of a woven cloth, the cohort themes and narratives, overlap. It is the intersections that cause patterns to be seen. Additionally, Tannen (2008) describes how narratives can be viewed on three levels of small-n, big-N and master narratives (section 5.4.5, pages 61-65), whilst Attride-Stirling (2001) describes three levels for thematic analysis, the individual themes, organising themes and global themes (section 6.1.8.1, pages 82-84). In my view, the three levels are equivalent and by combining my idea of warp and weft with those of Tannen (2008) and Attride-Stirling (2001), I anticipated being able to view intersections in three dimensions. In the end, I did not get to use my warp and weft design, but that does not detract from its usefulness had I followed my original path.

14.3.3.2 Self-determination continuum and feedback levels

I have complete sets of feedback sheets for participants from each cohort. In section 12.7.2. (pages 183-185), I suggested using Hattie and Timperley's (2007) four levels of feedback to analyse tutor feedback. Analysing tutor feedback was never the intention of this project, however the data is there to be analysed and could be key to helping understand which aspects of tutor feedback are helpful in aiding students' learning and engagement.

Since then, in section 13.6 (pages 199-202), I have successfully used these four levels of feedback to analyse participants' log entries. This is the aspect I am most pleased with. One facet of an enactivist methodology (section 8.6, pages 108-110) is to take multiple views on the data. Ryan and Deci's (2000) self-determination continuum enabled me to see that my participants appeared to engage with different levels of internality/externality at the course level and the task level (section 13.2, pages 193-194). Applying Hattie and Timperley's (2007) model for analysing tutor feedback to analyse student logs instead, linked to Ryan and Deci's (2000) self-determination continuum gives multiple views on the same data. As a result, I gained deeper insight to both my participants' engagement, concluding that Keziah's attitudes are linked to deeper learning styles than Leone's (section 13.6, pages 199-202). Using these two models linked has enabled a depth of analysis that can be taken forward in the current context, but also I believe transfer to different contexts.

14.4 Where am I now….?

14.4.1 … considering questions raised and missed opportunities

Early on in this project, I looked at face validity (section 3.3, pages 23-29). Nevo (1985) found that face validity could be measured with a high level of agreement across various sets of raters. But I found little evidence of face validity being used is any consistent manner at that time. It was only later when I had moved forward in a different direction that I realised that I could have designed a study to rate the MEC assessment tasks for face validity which I could have used to help improve engagement with the assessment tasks by trying to design tasks with a high face validity score (section 3.4, page 29). Since my original foray into face validity, I had not looked again for more literature on the topic until I began writing this final chapter. A quick cursory search revealed that that there are people, such as Moores, Jones &

Radley (2012) or Connell et al. (2018) using face validity in health care settings. Hence, there may be models created that I could use if I were to go down this route. I would need to investigate more fully what models are in use to see if they would suit my purposes. I would, of course, still have the option of creating my own.

14.4.2 … considering answers to my question

I have not answered my original question as such, but I have more understanding of issues surrounding it. I believe I have identified a new way to move forward.

An individual can be working with two different regulatory styles at the same time, e.g. task level and course level (section 13.6, pages 199-202). In my own case, taking course level as the PhD itself and task level as the work needed for one chapter, I am usually more intrinsically interested in the task level than in the course level. Once I find an interest in an area, I enjoy reading more sources and linking ideas together. Usually it is enough simply to start and my interest grows. At the course level, I think I am finishing because I started and because other people expect me to. I am working with more internal regulation at the task level than at the course level. This is in-line with my findings regarding Keziah (section 13.6.1, page 200). Leone, by contrast, appears to be more intrinsically motivated at the course level than the task level. I cannot generalise at all from so small a number of examples, but I am wondering if, with more participants, there would be such a pattern; i.e. some sort of tipping point at course level and then a divergence below that at task level.

Thinking about making assessment tasks fair, I have concluded that I am only able to observe any individual's motivational orientation at a point in time, it cannot be used to predict what will come. Perhaps if I could gather observations on the regulatory style of all individuals at the point in time that they engage with an assessment task, with a measure of their sense of fairness of the task, I may be able to see a pattern that stands across time.

14.5 Considering the impact this project has …

14.5.1 … on MEC tutors

Although I have not had the opportunity to feed my work back into my MEC, other MEC tutors may be interested in using the ideas I have raised, about level of feedback and the regulatory styles of the students, in order to look at their students' perceptions of and engagement with assessment.

14.5.2 … on people at the beginning of their PhD journey

I struggled with many of the ideas underpinning the research process, in particular tying down exactly what my philosophical stance is, and I suspect I am not alone. One of the changes that occurred as my work developed was that it became a narrative of my engagement with the research process, the trials and tribulations I encountered along the way, and how I overcame them. My own narrative of carrying out the research overlays the research I did, as a kind of meta-commentary. As I became aware that this is what I was doing, so I became aware that it would be useful to share my experience with other PhD researchers as they begin their research journey.

Some people may find it useful to read the story of my journey to understand that the, hopefully, tidy and well-structured thesis produced at the end, is the result of a messy and convoluted series of interrelated events and decisions. It may better prepare them for their own journey which will, of course, be completely different to mine, but is unlikely to be a smooth trajectory from setting out their question to stating their conclusions.

14.5.3 …. and on myself

I have learnt a great deal through undertaking this work. I now have a deeper understanding of the purpose of assessment and its effects on students, and one way of viewing, using motivational orientation, why different students engage differently. My understanding of validity and reliability in setting examinations has increased, as has my awareness of the effect of different previous experiences on students.

In terms of the research process itself, I now have a more robust ethical stance and I understand why it is important that I do. This may sound trite, but it is important to me; I

now know the difference between methods and methodology, and can see why it is important that my philosophical stance is explicit from the outset.

This project should have impacted on my professional practice within the MEC. Had I stayed in that post, I think I would be considering whether to measure students' internality/externality at the start and end of the course. I am now considering how doing so could be useful in a different context.

The National Student Survey (NSS) (https://www.thestudentsurvey.com/) allows students to rate their educational establishment against a range of criteria. The department I now work for wishes to improve how it is rated by students on the issue of whether "Marking and assessment has been fair". Work has been done by the department over several years to make the assessment regime more transparent to the students. My understanding is that the scores given by students have not improved. Hence, more knowledge is needed of what it is that is causing the students to think that marking and assessment are less fair than they could be. I believe I could adapt this project to help address that question using Rotter's (1966) locus of control scale linked with Ryan and Deci's (2000) self-determination continuum and, possibly, Hattie and Timperley's (2007) model for analysing feedback, by initially assessing students for externality/internality, then comparing that measure with their assessment of fairness.

14.6 Conclusion

This study has highlighted both the complexity of student's perception of assessment and of their own motivations in learning. Despite this I have found an underlying master narrative (Tannen, 2008) that assessment should be seen as "fair", and have also identified methods by which the students' motivations can be analysed and contrasted with their view of assessment. This work began in the setting of a MEC. Although my findings within that setting cannot be generalised to other settings, the methods I have developed can be and could form a valuable way forward in understanding how to ensure assessment is perceived as fair is many different contexts.

It has also thrown a spotlight on the challenges of undertaking research. My narrative describes the steps taken at every stage and how decisions were arrived at. It makes clear that other avenues than the one taken were considered and rejected. Whilst my experience is unique to me, I suspect that most PhD researchers will struggle with their own challenges and setbacks, and find their own solutions.

Appendices

Appendix 1: MEC Induction Week Questionnaire

Think back to times when you have been learning mathematics in the past. Think about how *you knew* how well you were doing?

1) Describe how *you knew* how well you were doing in mathematics?

2) Did you *always* know how well you were doing in mathematics in the same way or did it change? If it changed when did it change? What changed? What stayed the same?

3) What do you think is most *useful* for you to know how well you are doing in mathematics?

Now think about your mathematics teacher(s). How did they know how well you were doing in mathematics?

4) Describe how your mathematics teacher(s) knew how well you were doing?

5) Did your mathematics teacher(s) always use the same methods? Or did they change? If they changed when did they change?

6) Did mathematics teachers use different methods to other maths teachers or the same methods? What was the same and what was different?

7) Did maths teachers use different methods to teachers of other subjects? What was the same and what was different?

Appendix 2: MEC Final Week Questionnaire

Think back to when you started the MEC and your views on learning mathematics then. Think about learning mathematics on the MEC.
Think about how you knew how well you were doing throughout the MEC?

1) Describe how you knew how well you were doing in mathematics on the MEC?

2) Is this the same as how you knew how well you were doing in mathematics before the MEC? If it changed when did it change? What changed? What stayed the same?

3) What do you think is most useful for you to know how well you are doing in mathematics on the MEC?

4) Is this the same as what you found most useful for knowing how well you were doing in mathematics before the MEC?

Now think about your mathematics tutors on the MEC. How did they know how well you were doing in mathematics on the MEC?

5) Describe how your mathematics tutors knew how well you were doing in mathematics on the MEC?

6) Did your mathematics tutors always use the same methods to know how well you were doing in mathematics on the MEC? Or did they change? If they changed what changed? When did they change?

7) Did your mathematics tutors on the MEC use different methods to other mathematics teachers you have had in the past or the same methods? What was the same and what was different?

8) Is there anything else you would like to tell me about how you knew how well you were doing in mathematics on the MEC?

Appendix 3: MEC Induction Week Consent form

For my PhD I am researching aspects of my own practice. I would like to make use of data gathered from various sources during the course. I will ask for permission to use these as the need arises.

At the moment I would like to collect some data using a questionnaire. The questionnaire will be used for my research only and answers given will not be used in any way on the MEC course.

Any use made will be anonymised by allocating each participant a code and storing the coded data separately from the codes.

Results may be reported at conferences, in research reports and in my final thesis.

If you agree to take part now you will of course have the right to withdraw your permission for the use of the data gathered today at any time.

If you are willing to participate please print your name and sign below :

NAME:_____ Signature: _____

OR I do not want to participate:

NAME:_____ Signature: _____

I can be contacted by e-mail at _____ or by phone on _____.
My supervisor is _____
[NB: Names and contact details removed]

Appendix 4: MEC Final Week Consent form

For my PhD I would like to make use of data gathered from various sources. These are:

1a) How do I know how well I am doing questionnaire (Induction day)	
1b) (Final Day)	
2) Reflective Logs	
3)Feedback front sheets	
4) Course Evaluation responses	
5) Circle time responses	
6) Individual interviews (to be arranged)	

Would you be willing to allow the use of any of the above?
Please put a tick in the box if I may use it and a cross if I may not.

Any use made will be completely anonymised by allocating each participant a code and storing the coded data separately from the codes. Results may be reported at conferences, in research reports and in my final thesis.

If you agree to take part you will of course have the right to withdraw your permission for the use of any or all of these at any time.

My supervisor can be contacted if you have any concerns about ethical considerations relating to this research project on _____

If you are willing to participate please print your name and sign below :

NAME:_____ Signature: _____

And provide any or all of your contact details below if you are willing to be interviewed in the future or if you would like to see the final report.

E-mail: _____

Mobile: _____ _____

Phone: _____

Address:

OR I do not want to participate at all:

NAME: _____

I can be contacted by e-mail at _____- or by phone on _____
[NB: Names and contact details removed]

Appendix 5: Themes from induction week questionnaires.

Q1 is included as an example of how the responses were collated.

The first column is the theme.
The second contains the verbatim response from the questionnaire.
The third contains the questions and comments that occurred to me on the first pass through the data.
The last column contains a code letter to uniquely identify each person anonymously.
NB: some statements are highlighted to show that I have coded them under two headings at the moment.

Think back to times when you have been learning mathematics in the past. Think about how *you knew* how well you were doing?

Question1: Describe how *you knew* how well you were doing in mathematics?

Themes	Evidence	My questions (or comments)	Who
Correct Answers	I knew I was doing well because I was getting the correct answers the first time.	Who decides the answers are correct?	R
	Getting answers correct		F
	By answering questions in classes – ascertain how well I was understanding in topics		S
	Completing questions and worksheets		J
	Would usually get the majority of answers right		M
	By getting the right answer		V
Marks	Marks from work handed in	Is this the same or different to getting the correct answer?	S
	From my marks		L
	High marks in exams		B
	Examination, good grades		J
	Getting high marks in homework and end of topic exams		K
	I knew how well I was doing through assessments, small test/exams throughout my secondary school maths lessons	I am reading assessment as something 'formal' here	I
	Doing test exams and seeing how easy it was to remember past work		P
	From being assessed throughout maths, from a small test to exams, I've known my ability and my areas of weakness		U
	From having work marked		V
Easy/ability	Completing questions and worksheets		
	I was able to answer the questions or at least understand how the answer was arrived at		A
	Completing questions and worksheets		J
	Doing test exams and seeing how easy it was to remember past work		P

Enjoyment	I knew I was doing well because I enjoyed maths.		R
	I enjoyed doing the questions and I knew I could do them if I tried		A
	Self-satisfaction		J
Understanding	Understanding the concepts		F
	I was able to answer the questions or at least understand how the answer was arrived at		A
	From realising I understood how methods were relevant and that they made sense to me		L
	When I could 'fall back' on the method in every context – or knew when to apply what formula without having to think too hard		Q
	When it felt right; that I had an instincts of the method/possible methods to guide me		Y
	I did a lot of practice to understand concepts, theories and their applications, some to real life situations		Z
Teachers	Following the teacher's train of thought		F
	Praise from teacher		J
	Feedback from work task from teacher (i.e. corrections in wrong answers, how many were done right)		P
	Through encouragement from the teacher		V
Confidence	I didn't feel fear when I saw a question		A
	I felt confident in completing tasks set		M
Comparison with others	Selected for top set etc…..		B
	Comparison to class and their understanding		P
	I was able to sit in lessons beyond my course and understand what's being taught and explain concepts to my seniors		X
Self-help?	I could easily identify where I had made any errors and make the appropriate changes	Is this after a teacher has marked the work and identified the errors or as you work through it yourself?	M
	Explain things to others		U
	I was able to sit in lessons beyond my course and understand what's being taught and explain concepts to my seniors		X
Reliance on method?	When I could 'fall back' on the method in every context – or knew when to apply what formula without having to think too hard		Q
	I did a lot of practice to understand concepts, theories and their applications, some to real life situations		Z

Appendix 6: Lila's Log

The transcript of Lila's 'explosion' entry from her log has been removed to avoid identification of participants.

Appendix 7: Keziah's reflective log

Keziah's reflective log has been removed to avoid identification of participants.

It consists 24 weekly logs, with each week containing daily reflections. At the end of each week Keziah included targets arising from that week's log.

Appendix 8: Leone's reflective log

Leone's reflective log has been removed to avoid identification of participants.

It consists 16 logs. The first 5 are weekly logs, with each week containing daily reflections, followed by 11 logs which usually cover a 2-week period as one reflection. At the end of each log Leone usually included targets arising from that log.

Appendix 9: Keziah's interview transcript

The transcript of Keziah's interview has been removed to avoid identification of participants.

It consists of a 17 minute discussion between myself and Keziah.

Appendix 10: Leone's interview transcript

The transcript of Leone's interview has been removed to avoid identification of participants.

It consists of a 21 minute discussion between myself and Leone.

Appendix 11: Keziah's tutorial records

Keziah's tutorial records have been removed to avoid identification of participants.

There are three tutorials which occurred in week 2, 9 and 16 of the course.

Appendix 12: Leone's tutorial records

Leone's tutorial records have been removed to avoid identification of participants.

There are three tutorials which occurred in week 2, 9 and 18 of the course.

Appendix 13: Ethical conversation

Below is the procedure for gaining ethical approval at the time I began the PhD.

GSOE RESEARCH ETHICS FORM

It is important for members of the Graduate School of Education, as a community of researchers, to consider the ethical issues that arise, or may arise, in any research they propose to conduct. Increasingly, we are also accountable to external bodies to demonstrate that research proposals have had a degree of scrutiny.

The GSoE's process is designed to be supportive and educative. If you are preparing to submit a research proposal, you need to do the following:

1. **Arrange a meeting with a fellow researcher**
   The purpose of the meeting is to discuss ethical aspects of your proposed research, so you need to meet with someone with relevant research experience, perhaps from your CLIO centre. A list of prompts for your discussion is given below. Not all these headings will be relevant for any particular proposal.
2. **Complete the form on the back of this sheet**
   The form is designed to act as a record of your discussion and any decisions you make.
3. **Send a copy of the completed form to [names removed for anonymity purposes], Research Office.** You should also keep a copy for yourself. The forms will be kept until your research project has been completed. Forms may be looked at by the GSoE's ethics forum in order to identify training needs, for example.

If you need formal 'clearance' for a prospective funder, please contact the GSoE's ethics co-ordinator (currently Wan Ching Yee).

Please ensure that you allow time before any submission deadlines to complete this process.

Prompts for discussion

You are invited to consider the issues highlighted below and note any decisions made. You may wish to refer to relevant published ethical guidelines to prepare for your meeting. See www.bris.ac.uk/education/ethicnet for links to several such sets of guidelines.

1. Researcher access/ exit
2. Information given to participants
3. Participants right of withdrawal
4. Informed consent
5. Complaints procedure
6. Safety and well-being of participants/ researchers
7. Anonymity/ confidentiality
8. Data collection
9. Data analysis
10. Data storage
11. Data Protection Act
12. Feedback
13. Responsibilities to colleagues/ academic community
14. Reporting of research

Be aware that ethical responsibility continues throughout the research process. If further issues arise as your research progresses, it may be appropriate to cycle again through the above process.

Name(s): Jayne Stansfield
Proposed research project: An investigation into students' perceptions of assessment on one Mathematics Enhancement Course (MEC)

Proposed funder(s): Myself - PhD project

Discussant for the ethics meeting: [Name and signature available. Removed for reasons of anonymity]

Please include an outline of the project or append a short (1 page) summary:

My research questions is How do students' perceptions of assessment change over the course? My rationale for doing this is based on ad hoc conversations where students are sometimes don't view certain assessment tasks as being "valid" in which case I also sense that they may not fully engage with the task. By raising my awareness of their perceptions of assessment I hope to be able to work on engagement issues more effectively.

I will be using a largely narrative approach based in the ideas of Dewey's ontology of experience and the narrative /enactivist view that knowledge is experience.

I intend to use open question questionnaires to gather information from each cohort pre and post course relating to how students know how well they are doing, and to pick a few 'interesting' individuals to interview in-depth which I will develop as case-studies using some form of narrative analysis. I also intend to gather data from documentation gathered during the course such as reflective logs, assessment feedback, tutorial records etc. which will feed into the case studies. At the same time I intend to go across the grain by using thematic analysis to analyse issues that are pertinent across the cohort.

Ethical issues discussed and decisions taken (see list of prompts overleaf):

I am the course leader of the MEC so there are issues about relationship and power of which I need to maintain awareness throughout.

Anonymity will be ensured by giving each participant a code which will be used in any writing or discussions with e.g. supervisor.

I have developed a permission form on which I am asking for permission to use each type of data separately so that permission may be given for some aspects but not others. I am asking for

participants contact details so that I can contact them in future if I find that I need to clarify meanings but also so that they can be informed when the findings are published. It also allows for total non-participation and the right to withdraw at any stage. It contains my contact details to allow and we discussed and I have amended it to include that of my supervisor in case anyone wishes to complain about any aspects of my procedures to a third party. I will photocopy completed forms and return to the participants.

The course data is stored on my external drive so are the participant codes. Following this discussion I will purchase another media device on which to store the coding to anonymise the data and any other research specific data I acquire.

I need to maintain awareness that the items created as part of the course are generated for this purpose and not for my research purposes, I will thus amend my procedure to ask for permission to be involved in the research and to use the pre/post questionnaires and possible interviews at which time I will highlight that they will be used for research only and will not be used any way influence outcomes on the MEC. At the end of the MEC I will ask for permission as detailed above to use the items generated during the course.

If you feel you need to discuss any issue further, or to highlight difficulties, please contact the GSoE's ethics co-ordinator who will suggest possible ways forward.

Signed: [redacted] (Researcher) Signed: (Discussant)

Date: 15/02/2013

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